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RELATION OF BRONCHIECTASIS TO INFECTION OF THE PARANASAL SINUSES

G. E. HODGE, M.D.

MONTREAL, CANADA

During the past fifteen years widespread interest in the relationship of bronchiectasis to infection of the paranasal sinuses has been shown by the numerous articles which have appeared in the medical literature, especially in journals devoted to otolaryngology. This interest has been increased by the stimulating advances made in the fields of bronchoscopy, roentgenology and thoracic surgery and particularly by the increased knowledge of the reaction of the mucous membranes of the respiratory tract to allergy and to infection. The knowledge, however, of some of the phases of this relationship is still obscure. A brief résumé of the literature will help to summarize the present views on the subject.

CAUSAL RELATIONSHIP

As early as 1914 Thomson [1] suggested that persistent bronchorrhea might be due to chronic suppuration of the sinuses. Later Sergent,[2] Rist,[3] Webb and Gilbert [4] and others, noting the presence of sinusitis in patients with pulmonary suppuration, stressed the importance of a thorough examination of all the sinuses of these patients. Mullin [5] noted that in almost all his patients with bronchiectasis coexisting sinusitis occurred. He believed that primary bronchitis has a tendency to clear up unless it is kept active by a well marked infection of the sinuses.

Read before the Section on Laryngology, Otology and Rhinology at the Eighty-Sixth Annual Session of the American Medical Association, Atlantic City, N. J., June 13, 1935.

1. Thomson, St. Clair: Some of the Symptoms and Complications of Sinusitis, Practitioner **92**:745 (June) 1914.

2. Sergent, Emile: Histoire suggestive de quelques faux tuberculeux, diagnostics différentiels de la tuberculose pulmonaire et des affections des voies respiratoires supérieures, Bull. et mém. Soc. méd. d. hôp. de Paris **40**:1424 (July 28) 1916.

3. Rist, E.: Les principes de diagnostic rationnel de la tuberculose pulmonaire, Presse méd. **24**:305, 1916.

4. Webb, G. B., and Gilbert, G. B.: Bronchiectasis and Bronchitis Associated with Accessory Nasal Disease, J. A. M. A. **76**:714 (March 12) 1921.

5. Mullin, H. V.: Fundamental Things Influencing the Infection of the Nasal Sinuses, Ears and Lungs, Tr. Am. Acad. Ophth., 1933, p. 225.

Peroni,[6] after an extensive investigation of the sinuses of patients with bronchiectasis, concluded that coexisting sinusitis is often primary. When not primary, he believed that the nasal condition is sufficient to augment and protract the disease. Wasson [7] suggested the term broncho-sinusitis for infections involving the entire respiratory tract, especially those of a chronic nature. He observed 90 children from birth to the age of 8 years and expressed the opinion that while there is no common etiology this condition is greatly influenced by a lack of vitamins and by heredity, environment, climate and contamination from the air. Opie,[8] in a review of the literature on the pathologic anatomy of influenza from British and American sources, stated that infection of the nasal accessory sinuses appears to be an almost invariable accompaniment of influenzal pneumonia. It is interesting to note also that bronchiectasis has been found frequently as a sequela of influenza.

Clerf [9] suggested that bronchiectasis, when associated with infection of the sinuses, is usually bilateral. Adam,[10] on the contrary, stated that unilateral bronchiectasis occurs with sinusitis.

An interesting observation was made by Graham.[11] He noted the frequent occurrence of acute inflammation of the mucous membrane of bronchial fistulas, which took place about twenty-four hours after the onset of an acute infection of the sinuses. With improvement of the infection of the upper respiratory tract Graham observed that the reaction of the bronchial tissues also cleared up.

FREQUENCY OF RELATIONSHIP

Statistics from various centers have shown the association of chronic sinusitis and nontuberculous bronchiectasis to be extremely common. It has been said to vary from 55 to 100 per cent; Clerf reported it in 82.4 per cent of cases, Dunham and Skavlem [12] in 73 per cent, and

6. Peroni, A.: Relation of Chronic Diseases of Paranasal Sinuses to Bronchiectasis, Arch. ital. di otol. **44**:385, 1933.

7. Wasson, W. W.: Bronchosinusitis Disease, J. A. M. A. **93**:2018 (Dec. 28) 1929.

8. Opie, E.: The Pathologic Anatomy of Influenza, Arch. Path. **5**:285 (Feb.) 1928.

9. Clerf, L. H.: Bronchiectasis Associated with Disease of the Nasal Accessory Sinuses, Arch. Otolaryng. **6**:28 (July) 1927.

10. Adam, James: Bronchiectasis of Inhalatory Origin, Tr. Med.-Chir. Soc. Glasgow **21**:133 (April 8) 1927.

11. Graham, E. A.: The Surgical Treatment of Pulmonary Suppuration in Children, J. A. M. A. **87**:806 (Sept. 11) 1926; Observations on Reaction of Bronchial Fistulae to Acute Infections of Upper Respiratory Tract, Am. J. Surg. **14**:382, 1931.

12. Dunham, Kennon, and Skavlem, J. H.: Chronic Nontuberculous Infections, U. S. Vet. Bur. M. Bull. **3**:861 (Sept.) 1927.

Quinn and Meyer [13] in 58 per cent. In a series of 37 patients with bronchiectasis observed at the Montreal General Hospital I found that approximately 75 per cent had associated sinusitis. Like the majority of other authors, I found the maxillary sinus most frequently affected.

Just what the frequency of this relationship indicated is still a subject for discussion. Numerous authors have insisted that sinusitis is the primary cause of bronchiectasis; others have suggested that bronchiectasis is primary. The latter has not, however, been proved. In an effort to check this possibility in 10 patients with bronchiectasis observed at the Montreal General Hospital, I placed a small amount of iodized poppy-seed oil 40 per cent in the trachea. The patients were placed in position and asked to cough. In only 3 patients were traces of iodized poppy-seed oil 40 per cent seen in the nasopharynx in the roentgenogram. Mild silver protein was used in a similar number of patients. Only a few showed any stain in the nasopharynx. No iodized poppy-seed oil or mild silver proteins was found in the nose. During coughing the soft palate seemed a fairly efficient barrier to the entrance of these substances into the nasopharynx. The majority of writers on this subject have expressed the opinion that the whole respiratory tract is simultaneously affected and that, although the bronchitis and pneumonitis have a tendency to clear up, they are kept active by the constant overflow from infected sinuses.

The various routes by which infection of the nasal sinuses may influence the respiratory tract have been frequently referred to. Davis [14] described the following routes:

1. Direct extension of the inflammation of the larynx, trachea and bronchi or extension of the infection through the blood and lymphatic streams.

2. Aggravation or increase of an existing lesion of the lungs.

3. Existence of nasal sepsis as part of the general infection, in which both the upper and the lower respiratory tracts are involved.

Much has been done experimentally to show the relationship of sinusitis and nontuberculous bronchiectasis. The work of Mullin and Ryder [15] has been cited frequently. These authors demonstrated the lymphatic drainage of the maxillary sinuses and their connection with the lungs and also the route of inhalation by which nasal secretions reach the lungs. The work of Pfhaler [16] of Philadelphia and of Le

13. Quinn, L. H., and Meyer, O. O.: The Relation of Sinusitis and Bronchiectasis, Arch. Otolaryng. **10**:152 (Aug.) 1929.

14. Davis, E. D. D.: The Influence of Naso-Oral Sepsis on the Lungs and Gastrointestinal Tract, J. Laryng. & Otol. **43**:465 (July) 1928.

15. Mullin, W. V., and Ryder, C. F.: The Studies on the Lymph Drainage of the Accessory Nasal Sinuses, Laryngoscope **31**:158 (March) 1921; Am. Rev. Tuberc. **4**:683, 1920.

16. Pfahler, G. E.: Lymphatic Drainage from Maxillary Sinuses, Am. J. Roentgenol. **27**:352, 1932.

Mée and Bouchet [17] of Paris with iodized poppy-seed oil 40 per cent seems to have corroborated these earlier experiments completely. Quinn and Meyer demonstrated the presence of this oil in the thorax after instillation into the nostrils of sleeping patients. And McLaurin [18] showed that after the oil was placed in the antrum it could be demonstrated in the chest by roentgenograms.

These experiments clearly demonstrated that chronic sinusitis must play an important part in infections of the chest and that infection reaches the thorax chiefly by inhalation and by the lymphatic routes.

Some criticism of the latter opinion has been made recently, and there now seems to be a general opinion that the etiologic influence of the sinuses in cases of focal infection has been overemphasized. Childrey and Essex [19] described the mucous membrane of the sinuses as being highly resistant to absorption. Lawson,[20] however, concluded that toxemia associated with chronic disease of the membrane of the sinuses is of great clinical significance and probably originates from the absorption of small quantities of highly virulent toxins generated within the cavities of the sinuses. Kistner [21] and Jones demonstrated streptococci of virulent types in the submucosa of numerous patients with disease of the coronary vessels. Hurd [22] and Snyder expressed the opinion that sinusitis without evidence of discharge is responsible for many cases of serious arthritis. In a recent interesting article Tilley [23] pointed out that frequently there is a residual infection in the bone tissues of the capsule of a sinus and that this is one of the most potent foci for the vascular transmission of septic organisms and their toxins. It is therefore probable that in this type of case and in the so-called silent cases of sinusitis with little drainage absorption from the sinuses to the lungs is most marked. The absence of all symptoms of disease of the sinuses when associated with bronchiectasis has been noted frequently, but I do not believe it has been sufficiently emphasized. Frequently nasal

17. Le Mée, J. M., and Bouchet, M.: Mode d'élimination du lipiodol dans la méthode de déplacement, Ann. d'oto-laryng., Aug., 1932, p. 919.

18. McLaurin, J. G.: Chest Complications of Sinus Disease, Ann. Otol., Rhin. & Laryng. **41**:780, 1932.

19. Childrey, J. H., and Essex, H. E.: Absorption from the Mucosa of the Frontal Sinus, Arch. Otolaryng. **14**:564 (Nov.) 1931.

20. Lawson, L. J.: The Rôle of Nasal Accessory Sinus Membrane in Systemic Infections and Toxemias, Ann. Otol., Rhin. & Laryng. **39**:159 (March) 1930.

21. Kistner, F. B.: Chronic Nonpurulent Sinusitis and Its Clinical Significance, Ann. Otol., Rhin. & Laryng. **38**:795 (Sept.) 1929.

22. Hurd, Lee M.: Chronic Infections of the Nasal Accessory Sinuses, Ann. Otol., Rhin. & Laryng. **39**:960 (Dec.) 1930.

23. Tilley, A.: Chronic Pyogenic Inflammation of the Antrum and Other Accessory Sinuses, J. Laryng. & Otol. **50**:1 (Jan.) 1935.

involvement, when unaccompanied by pain, is not complained of by the patient, and only a thorough examination will disclose infection of the sinuses. Mullin, in reporting on 295 cases, stated that in nearly 7 per cent cough was the only symptom, although well marked infection of the sinuses was present in all. Frequently cases have been reported in which treatment for tuberculosis had been given over a period of years and in which the condition in reality had been sinusitis and bronchiectasis.

Clerf [24] has emphasized an experience that is perhaps common among laryngologists. A patient complaining only of chronic cough and a husky voice is found on laryngeal examination to have chronic laryngotracheitis. A thorough physical examination often fails to reveal evidence of thoracic disease; yet an examination of the sinuses and nose reveals chronic sinusitis. A routine examination of the sinuses should be carried out on all patients with infection of the lower respiratory tract. This procedure would reveal, as many authors have indicated, many unsuspected cases of involvement of the sinuses.

The assumption then is that following sinusitis chronic bronchitis develops and in the course of time, perhaps years, bronchiectasis. The process by which this occurs is not completely understood, and there seem to be many exceptions. Frequently, a patient with involvement of the sinuses, even with pansinusitis, with a history of postnasal discharge and cough for years, is found to have little or no evidence of thoracic disease. Why then do the lungs seem to resist infection in some patients and to succumb so easily in others? The resistance of the individual patient and the virulence of the organism must of course be taken into consideration. Why, also, if this assumption is correct, do chronic sinusitis and bronchiectasis occur in very young children in whom the duration is obviously short? All recent evidence would seem definitely to suggest that some change occurs in childhood which predisposes these patients to subsequent infection of the lungs.

INFLUENCE OF ATELECTASIS ON BRONCHIECTASIS

Bronchiectasis has been well described as a disease of childhood. And it is interesting to note in reports of cases the frequency with which patients with bronchiectasis date their symptoms to early childhood.

In recent years authors have described a triangular shadow at the base of the lung in roentgenograms of children. Singer and Graham [25] were the first in America, in 1925, to recognize this shadow as a sign

24. Clerf, L. H.: Interrelationship of Sinus Disease and Bronchiectasis with Special Reference to Prognosis, Laryngoscope **44**:568 (July) 1934.

25. Singer, J. J., and Graham, E. A.: Roentgen-Ray Study of Bronchiectasis, Am. J. Roentgenol. **15**:54, 1926.

of atelectasis and bronchiectasis of the lower lobe. Anspach [26] reported a study of 50 of these cases in children. He found that when this triangular shadow fluctuated in size and density from one examination to the next only tubular bronchiectasis developed or the chest cleared up with little or no evidence of dilatation of the bronchi. When drainage did not occur, with frequent reexpansion of the lobe or lobules, saccular bronchiectasis resulted. The latter condition developed in the finer, more distal, bronchi, in which thick secretion easily produced complete obstruction. Anspach expressed the opinion that allergy may aid in bringing about the initial obstruction by the swelling of the mucous membrane and the production of a thick, tenacious secretion.

Like other writers, Anspach [26] suggested that atelectasis is the precursor of bronchiectasis in adults. Frequently, permanent damage occurs in the lung in early infancy, and even though dilatation does not occur, the bronchi are left in a weakened condition. This, he suggested, aids in the development of bronchiectasis and associated clinical symptoms in adult life. The research study by Robinson [27] of Toronto, who reported on the pathologic changes following lobectomy for bronchiectasis in 16 cases, would seem to corroborate this view.

It is therefore interesting that since the advent of pneumography and the widespread use of iodized poppy-seed oil 40 per cent, various writers have shown that dry bronchiectasis exists, as evidenced by bronchial dilatations. This has been noted in both children and adults. Wall and Hoyle,[28] in citing 30 cases from the literature and reporting on 20 of their own cases observed in two years, concluded that dry bronchiectasis is extremely common and that the great danger lies in the development of wet bronchiectasis.

INFECTION OF THE RESPIRATORY TRACT AS A WHOLE

There has been a tendency among a number of writers to describe infections of the mucous membrane of the respiratory tract as separate entities instead of as a whole. The reaction of the mucous membrane to infection is much the same, whether in the nose or in the thorax. It is interesting, therefore, in a case of fetid bronchiectasis to find changes in the mucous membrane similar to those seen in the nose in a case of atrophic rhinitis with ozena. Both conditions have been attributed to a multitude of bacteria, while numerous theories have been cited to describe the etiology. Current investigation is helping to increase the

26. Anspach, W. E.: Atelectasis and Bronchiectasis in Children, Am. J. Dis. Child. **47**:1011 (May) 1934.

27. Robinson, W. L.: Bronchiectasis: A Study of the Pathology of Sixteen Surgical Lobectomies for Bronchiectasis, Brit. J. Surg. **21**:302 (Oct.) 1933.

28. Wall, C., and Hoyle, J. C.: Observations on Dry Bronchiectasis, Brit. M. J. **1**:597, 1933.

knowledge of the reaction of the respiratory tract to allergy. Bronchiectasis has been produced in guinea-pigs experimentally by causing a deficiency of vitamins. And the investigations of Dean [29] and Hetler have shown that deficiency of vitamin A will cause sinusitis in monkeys but that a diet high in vitamins and deficient in protein will produce both suppurative sinusitis and otitis. While specially planned diets have been shown to be of great value in the treatment of infection of the upper respiratory tract, Dean emphasized that disease of the sinuses cannot be cured by diet alone. Fenton [30] showed experimentally that in a well nourished cat a special diet will not arrest acute sinusitis or prevent its development into chronic sinusitis.

The histiocyte system has been found by Fenton and his co-workers to take up early defensive measures in the membrane of the sinuses and of the ears during an acute invasion or an acute exacerbation of a chronic process. Plasma cells have been found to the exclusion of histiocytes in all late and chronic stages of inflammation and repair.

Sippe [31] in a recent article suggested that hypoglycemia and ketosis may play a part in chronic disease of the antrum and bronchiectasis in both children and adults. He reported 9 cases: 3 early cases in which complete relief of symptoms occurred and 6 advanced cases in which there was considerable improvement following the administration of dextrose. While the number of cases is too small to permit one to draw any conclusions, Sippe suggested that many of the persons who have chronic sinusitis and pulmonary fibrosis have an exudative diathesis as the basis for the development of lesions of the respiratory tract. Frequently this inability to retain water in the tissues is due to an insufficient supply of available dextrose, as evidenced by hypoglycemia or ketosis.

While it is true that there are many exceptions, all the present evidence tends to show that suitable soil is developed in early childhood for subsequent infections of the respiratory tract. Sinusitis which takes part in the involvement of the whole respiratory tract may date from infancy, the constant overflow of secretion being sufficient to keep the bronchial condition active. Or sinusitis due to influenza or to the infectious diseases occurring in later life finds in the bronchial mucous membrane a soil suitable for the development of bronchiectasis. While some patients with bronchiectasis do not show any evidence of sinusitis even after the most thorough examination, the possibility that infection

29. Dean, L. W.: Relationship Between Diseases of Nose (Chiefly Allergic) and Throat and Pulmonary Diseases, J. Missouri M. A. **31**:13, 1934.

30. Fenton, R. A.: Recent Discoveries in the Pathology of the Nasal and Animal Mucosa, Canad. M. A. J. **32**:147 (Feb.) 1935.

31. Sippe, Clive: Hypoglycaemia and Ketosis: Relationship to Chronic Antral Disease and Bronchiectasis, M. J. Australia **1**:675 (May 26) 1934.

of the sinuses might have been present at some time cannot be excluded. In view of the more recent knowledge, it is perhaps reasonable to assume that in patients with bronchiectasis the sinuses share the primary infection of the whole respiratory tract. Owing to good drainage, the upper portion of the tract clears up, while the extreme degree of pneumonitis present prevents the lower portion from clearing. Considerably more investigation is needed to decide just what part allergy or hypoglycemia plays in sensitization of the whole tract to infection.

TREATMENT

Discussion of the treatment of bronchiectasis is beyond the scope of this paper. There is, however, general agreement that once bronchial dilatation has occurred, only radical surgical intervention, which unfortunately still has a high mortality rate, is successful in curing this condition. And while operation on the nasal accessory sinuses will not cure bronchiectasis, any focus should be, when possible, removed before surgical treatment of the lung is instituted.

It is in children that the best results are obtained from conservative treatment, and this should be commenced early. The upper respiratory tract should receive active treatment. This usually means relief from mechanical obstruction, resulting in free drainage. Bronchoscopic suction, postural treatment and vaccine therapy all have their part. A child with sinusitis who has frequent attacks of bronchitis and pneumonia should be regarded as having potential bronchiectasis. He should be carefully guarded so far as climate, diet, contamination from the air and work are concerned, in order to protect the respiratory tract from further infection.

SUMMARY

1. The association of nontuberculous bronchiectasis and infection of the paranasal sinuses is extremely common.

2. Pulmonary collapse and pneumonitis, frequently noted in early childhood, so weaken the structure of the lungs that there is a suitable soil for subsequent infection.

3. Bronchiectasis, as evidenced by the number of dry cavities reported in the lungs of both children and adults, is more frequent than was previously supposed.

4. Infection of the sinuses associated with bronchiectasis may date from early childhood or may occur as a secondary infection in later life.

5. The treatment of bronchiectasis is surgical. Any focus of infection should be, when possible, removed from the upper respiratory tract before surgical intervention on the lungs is attempted. Best results will be obtained from medical treatment if it is commenced in early childhood.

ABSTRACT OF DISCUSSION

DR. E. G. GILL, Roanoke, Va.: The interrelationship of disease of the sinuses and bronchiectasis is generally recognized and accepted by otolaryngologists. However, in summarizing this paper I find that problems of this disease still exist that are open for discussion, some of which are: 1. Is bronchiectasis always unilateral, or is it sometimes bilateral when associated with infection of the sinuses? 2. Are the paranasal sinuses ever infected secondarily in patients suffering from bronchiectasis? 3. To what extent does atelectasis influence the development of bronchiectasis? 4. Is absorption of infection from the sinuses to the lungs more marked in the so-called silent cases of sinusitis with little drainage or in the cases of sinusitis with profuse drainage? 5. On the basis of an accepted relationship between bronchiectasis and sinusitis, why is it that some patients have infection of the sinuses, postnasal discharge and cough without having bronchiectasis? 6. Does a deficiency of vitamins in the diet have a part in the development of bronchiectasis in children? 7. To what extent does allergy influence the development of bronchiectasis?

The incidence and the early diagnosis of these diseases can be determined only through the intimate cooperation of the otolaryngologist, pediatrician, internist, bronchoscopist and roentgenologist. The laryngologist should always have in mind the possibility of an infection of the lower respiratory tract in patients suffering from disease of the sinuses and the internist and pediatrician should consider infection of the sinuses as an etiologic possibility in cases of unexplained cough.

The diseases of childhood, such as measles, whooping cough, scarlet fever and influenza, are frequently complicated with infection of the sinuses and bronchitis, and the attending physician should not allow the general systemic condition to overshadow the symptoms of sinusitis. Some observers of these diseases have found that many patients give a history of cough following one of the diseases of childhood and that the initial attack of infection of the sinuses occurs at the same time. For this reason they believe that sinusitis and bronchitis are often of simultaneous origin. Acute infection of the sinuses complicated with laryngotracheobronchitis always leaves permanent pathologic changes in varying degrees in the involved mucous membranes, thus rendering the patient susceptible to subsequent attacks of infection. One should be as alert in the prevention and treatment of this type of infection as one is when dealing with scarlet fever, iritis or typhoid.

When one considers the unsettled problems of these diseases, the number of patients who are being treated for pulmonary tuberculosis when in reality they have bronchiectasis with associated infection of the sinuses and the impossibility of effecting a complete cure of chronic bronchiectasis, it behooves the members of the medical profession to use every legitimate means to bring to the attention of patients the importance of prevention, early diagnosis and adequate treatment of these diseases.

DR. HERMAN J. MOERSCH, Rochester, Minn.: The relationship of disease of the sinuses to bronchiectasis constitutes an interesting problem. Two theories are especially deserving of consideration in all cases of bronchiectasis of unknown origin: (1) the theory so ably discussed by Dr. Hodge and (2) the theory that bronchiectasis develops because of some congenital anatomic alteration in the tracheobronchial tree.

A high incidence of disease of the sinuses among patients who have bronchiectasis was referred to by Dr. Hodge. Dr. Hempstead and I found in a review of 245 consecutive cases of bronchiectasis that disease of the sinuses was present in only a third; this is a much lower incidence than generally is reported.

An observation that would seem to demonstrate a close relationship between infection of the sinuses and bronchiectasis can be made readily in cases of bronchial fistula. Ordinarily there is only a small amount of mucoid secretion from the fistula. Within twenty-four hours after the development of infection of the upper part of the respiratory tract the mucous membrane of the fistula becomes red and swollen and the secretion becomes purulent.

Certain observers, however, have expressed the opinion that bronchiectasis occurs primarily because of a congenital anatomic alteration in the tracheobronchial tree and that it manifests itself only when hemorrhage or some secondary, intercurrent pulmonary infection takes place. They have called attention to the dry type of bronchiectasis that may remain dormant for years, then suddenly manifest itself in the presence of hemorrhage and immediately display all the characteristic signs of bronchiectasis in the absence of infection.

With reference to the value of treatment in bronchiectasis, it is important to distinguish between anatomic and clinical improvement. It is doubtful whether a patient who has definite anatomic bronchiectasis will give evidence of marked change in the anatomic status after the infection of the sinuses is eliminated. For clinical improvement, however, there is a more hopeful outlook.

Although it was with considerable skepticism that Dr. Hempstead and I anticipated benefit from the elimination of infection of the sinuses to our surprise 50 per cent of the patients operated on felt that they had obtained benefit. An interesting feature, however, was that in some of the cases in which clinical benefit resulted there was slight or no change in the physical findings.

It is imperative that the sinuses be thoroughly investigated in all cases of bronchiectasis, and if infection is definitely present it should be eliminated. It is important, however, that great care be exercised in operation on the sinuses in cases of bronchiectasis unless infection is definitely present, because otherwise a valuable procedure may easily be brought into general disrepute.

Dr. Frank R. Spencer, Boulder, Colo.: This disease concerns otolaryngologists, pediatricians, internists, bronchoscopists and in some instances even the general surgeon. During the Great War physicians in the service had orders from the Surgeon-General's office concerning infections of the lungs and their relationship to disease of the sinuses. Many soldiers in the trenches were sent back to a base hospital with a diagnosis of possible pulmonary tuberculosis. Many of them did not have pulmonary tuberculosis; they had a nontuberculous infection often due to disease of the sinuses.

About that time the late William V. Mullin did excellent work in demonstrating the lymphatic drainage from the sinuses and the importance of this drainage in spreading infection from the sinuses. A more recent paper by Dr. Mullin was a report of a large series of cases of bronchiectasis, which substantiated the earlier observations.

In Colorado one sees three groups of patients who have bronchiectasis. In the first group are patients who do not have any disease of the sinuses. It is possible that they had disease of the sinuses in early childhood and made a complete recovery, either with or without treatment. In the second group are patients who have definite bronchiectasis and definite disease of the sinuses. It seems likely that disease of the sinuses is the cause of the bronchiectasis. I believe that these patients show some improvement when the disease of the sinuses is properly cared for, but they are not cured, because once the bronchiectasis becomes well established it has a decided tendency to become gradually worse as the years go by. In the third group are patients who have not only disease of the sinuses but bronchiectasis and

slight pulmonary tuberculosis. Quite a few of these patients are sent West with a diagnosis of pulmonary tuberculosis. Bronchiectasis has not been recognized, and the pulmonary tuberculosis plays only a minor part in the patient's disease and in the general care that these patients need.

Dr. Myron Metzenbaum, Cleveland: The paranasal sinuses are evolved at birth. The antrums, which are well developed after the fifteenth month, are relatively large cavities in the infant. Severe infections of the mucous membranes of the upper respiratory tract may and frequently do involve the mucous membrane linings of the nasal accessory sinuses. Influenza, bronchitis, pneumonia, the common head cold, scarlet fever and measles, the swimming pool and the bathing beach are all potent factors in the development of infections of the sinuses.

A chronic purulent infection of the antrums results in marked thickening of the mucous membranes and often in polypoid degeneration, even in young children. This pathologic change is demonstrable in roentgenograms with or without the introduction of iodized poppy-seed oil 40 per cent and at the time of surgical intervention on the antrums.

Aspirated secretions from the antrums cause bronchial irritation which may result in bronchiectasis with or without asthmatic attacks. Treatment for bronchiectasis resulting from a definite infection of the antrum includes the establishment of permanent ventilation and drainage of the infected antrum and when indicated removal of the pathologic changes within the antrum.

In children, dry suction removes the plugs of secretion from the ostia and the secretion from all the cells, thereby establishing ventilation and drainage simultaneously to all the infected sinuses. When these methods fail, surgical intervention becomes necessary.

In children the Caldwell-Luc operation destroys the buds of the unerupted teeth. Therefore one should perform an intranasal window resection and remove the lining of the antrum when a pathologic process is present. This procedure usually results in an amelioration of most of the symptoms in cases of bronchiectasis of not too long standing due to infection of the antrum and may result in a cure in those cases in which no secondary pulmonary changes have taken place.

Dr. George E. Hodge, Montreal, Canada: I have little to add on this subject other than to thank my colleagues for their criticism and suggestion. As Dr. Moersch stated, the point may again be emphasized that statistics from various parts of the world show the universal frequency with which infection of the sinuses is associated with bronchiectasis. I do not believe that this fact can be discounted by any one. I was surprised, therefore, in listening to a discussion on bronchiectasis at the meeting of the Section on Practice of Medicine, to note that no comment was made on the relationship of sinusitis to bronchiectasis.

NEOPLASMS INVOLVING THE MIDDLE EAR

LEROY A. SCHALL, M.D.
BOSTON

In no field of otology is there so much confusion as in the treatment of neoplasms of the middle ear. The general attitude has been that radical mastoidectomy should be performed but that the outlook is hopeless and the patient doomed.

The literature is scanty. The older literature refers to malignant growths of the middle ear as medical curiosities. Newhart [1] stated that he found reports of only 8 cases in the American literature. Keeler [2] in 1922 thoroughly reviewed the literature and compiled 60 instances and added 2 of his own. Since 1922, Barnes,[3] Furstenberg,[4] Lewis,[5] Burton [6] and Fraser [7] have presented reports of cases.

INCIDENCE

In the past twelve years 15 patients with neoplasms involving the middle ear were seen by the otologic staff of the Massachusetts Eye and Ear Infirmary. Three of these patients are now living—two, four and nine years, respectively, after treatment. In the same period 90,040 patients with pathologic conditions of the ear were seen at this hospital; so in this series the incidence was 1 in 6,000 cases of disease of the ear.

This paper is based on personal experience in 6 cases—2 from the series of the Massachusetts Eye and Ear Infirmary, 3 from the Collis P. Huntington Memorial Hospital and 1 from private practice. They were equally divided between the sexes; all the patients were past 45.

Read before the Section on Laryngology, Otology and Rhinology at the Eighty-Sixth Annual Session of the American Medical Association, Atlantic City, N. J., June 12, 1935.

1. Newhart, Horace: Primary Carcinoma of the Middle Ear: Report of a Case, Laryngoscope **27**:543 (July) 1917.

2. Keeler, J. Clarence: Some Remarks on Otitic Malignancy, Tr. Am. Laryng., Rhin. & Otol. Soc., 1922, p. 25.

3. Barnes, E. B.: Carcinoma of the Ear, Proc. Roy. Soc. Med. **23**:1231 (June) 1930.

4. Furstenberg, A. C.: Primary Adenocarcinoma of the Middle Ear and Mastoid, Ann. Otol., Rhin. & Laryng. **33**:677 (Sept.) 1924.

5. Lewis, Fielding O.: Case of Cancer Involving the Larynx, Tonsil and Ear, S. Clin. North America **7**:365 (April) 1927.

6. Burton, F. A.: Epithelioma of Middle Ear and Mastoid: Report of a Case, Laryngoscope **27**:755 (Oct.) 1927.

7. Fraser, J. S.: Malignant Disease of the External Acoustic Meatus and Middle Ear, Proc. Roy. Soc. Med. **23**:1235 (June) 1930.

TYPES OF TUMORS

The following types of neoplasms were represented:

	No. of Cases
Basal cell carcinoma	2
Adenocarcinoma	1
Epidermoid carcinoma, grade 4	1
Hemangio-endothelioma	2

SYMPTOMS AND DIAGNOSIS

The most constant findings, although it may have but a casual relationship, is chronic otorrhea. The symptom most suggestive of neoplasm is the tendency to bleed from the external auditory canal. This bleeding may be of any degree of severity from a blood-tinged discharge to severe hemorrhage after removal of granulations or an aural polyp. Pain may be an early symptom, but usually it does not occur until the growth has attained sufficient size to cause pressure. Facial paralysis occurred early in 2 cases of this series. In the early stage there may be no symptom suggestive of neoplasm except the finding of an "aural polyp" on clinical examination. The removal of this "polyp" is followed by excessive bleeding. Microscopic examination of the specimen reveals the true diagnosis. This was true in 2 of my cases. Therefore, I believe that if every aural polyp were studied microscopically the early diagnosis of a malignant growth would be made more frequently.

In the early stage the roentgenogram may be of no diagnostic value. In a case of hemangio-endothelioma in which the roentgenograms revealed nothing abnormal, extension of the tumor to the deep posterior canal cells was found at operation.

TREATMENT

In the older literature the treatment reported for malignant conditions of the middle ear was strictly surgical. The mortality rate after surgical treatment alone was so high that the pessimistic attitude of the otologists of that period can be readily appreciated.

The use of irradiation alone has been disappointing. Robinson [8] in 5 cases of malignant growth of the middle ear obtained no cures by radium therapy. Ullmann [9] used irradiation for the treatment of malignant conditions of the ear, but he gave no statistics. In the external use of irradiation the clinical fact is ignored that even with a dosage sufficient to cause necrosis of the bone it may have no effect on the tumor invading the bone.

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8. Robinson, G. Allen: Malignant Tumors of the Ear, Laryngoscope **41**:467 (July) 1931.

9. Ullmann, H. J.: Treatment of Ear Malignancy, California & West. Med. **37**:369 (Dec.) 1932.

Conservative surgical procedure has no place in the treatment of aural neoplasms. Given a positive result of biopsy on a lesion beyond the isthmus of the external auditory canal, I contend that the site of origin cannot be determined by clinical examination. I believe, therefore, that a neoplasm in the external auditory canal beyond the isthmus is a potential malignant growth of the middle ear and should be treated as such by the following procedures:

1. Wide removal of the growth by excision of the entire cutaneous canal. Any surgical procedure less radical than the removal of the entire cutaneous canal is inadequate. Except in case of external lesions, the use of electrocoagulation in the canal, either for removal of a growth or for the excision of a part of the canal, has been followed by

Results of Treatment in Six Cases of Neoplasm Involving the Middle Ear

Case	Diagnosis	Structures	Treatment	Status of Patient	Time Since Treatment
1	Epidermoid carcinoma, grade 4	Middle ear; mastoid; sternocleidomastoid muscle	Radical mastoidectomy; radium therapy; resection of sternocleidomastoid muscle	Dead	3 mo.
2	Hemangioendothelioma	Middle ear; canal	Radical mastoidectomy; irradiation; radium therapy	Living; no recurrence	4 yrs.
3	Hemangioendothelioma	Middle ear; canal; mastoid	Radical mastoidectomy; irradiation; radium therapy	Death from pneumonia; no recurrence of tumor	2 yrs.
4	Basal cell carcinoma	Canal; middle ear	Radical mastoidectomy; radium therapy; irradiation	Living; no recurrence	2 yrs., 9 mo.
5	Adenocarcinoma	Canal; middle ear	Radical mastoidectomy; irradiation	Living; no recurrence	4 yrs., 2 mo.
6	Basal cell carcinoma	Canal; middle ear	Radical mastoidectomy; radium therapy; irradiation	Living; no recurrence	3 yrs., 2 mo.

too many recurrences to be justified. Sufficient current to destroy the tumor may likewise be enough to destroy the underlying bone and produce necrosis.

2. Radical mastoidectomy. This operation should be performed for inspection of the middle ear and the cavity of the mastoid and to secure sufficient space for the proper application of radium. In the case of a growth internal to the isthmus of the canal, I repeat, its origin cannot be determined by clinical examination. Only by radical mastoidectomy can involvement of the middle ear be excluded. The prognosis in cases of undiagnosed malignant growth of the middle ear is too grave for one to neglect the utilization of every possible procedure in order to arrive at a correct diagnosis. The records of cases in the older literature are tragic pictures of the results of late diagnosis.

With 2 patients I followed the technic given in textbooks and left the postaural mastoidectomy incision wide open. At the suggestion of

Dr. Edwards W. Herman, I removed the concha and cutaneous canal of a patient with a small diploic mastoid, and by elevating the periosteum over the mastoid I had an excellent exposure for radical mastoidectomy. I have now used this approach in 4 cases.

3. Irradiation. Radiation to be effective must be applied at the site of the lesion. Sufficient space for the proper application of radium can be obtained only by a radical mastoidectomy. Radium in the form of platinum needles with a wall 0.5 mm. thick, protected by from 0.5 to 1 cm. of gauze, is used. Depending on the type of tumor, a total dosage of from 600 to 1,000 milligram hours is employed. This dosage has caused neither excessive necrosis of the bone nor cerebral damage.

CONCLUSIONS

1. Neoplasms of the middle ear are not medical curiosities.

2. Every bleeding aural growth should be suspected of being malignant until microscopic examination proves otherwise.

3. A malignant growth presenting itself beyond the isthmus of the external auditory canal is a potential lesion of the middle ear.

4. Radical mastoidectomy with removal of the entire cutaneous canal is indicated in every case of malignant growth presenting itself in the external auditory canal beyond the isthmus. This procedure is to be followed by irradiation.

5. That 5 patients have had no recurrence for from two to more than four years after treatment of neoplasm of the middle ear is proof that the prognosis in the disease is no longer hopeless.

ABSTRACT OF DISCUSSION

Dr. B. H. Shuster, Philadelphia: Dr. Pfahler, who has had a large experience with malignant conditions, could find in his records only 4 cases that came under his observation. At one time his search of the literature revealed 1 instance in 40,000 cases of chronic conditions of the ear. Dr. Schall's record, 1 case in 6,000, may signify that the condition is overlooked. This is even more important in view of the fact that some patients recovered when properly treated. Some years ago one of the men on the hospital staff suspected that in some cases chronic discharge from the ear was due to the Vincent organism. He soon found 3 or 4 cases in which the condition cleared up rapidly with change of treatment. Dr. Schall suggests that in his cases bleeding was a significant symptom. Dr. Pfahler's patients suffered unexplainable pain in the ear for varying lengths of time. All the writers agree that malignant conditions seem to develop on the basis of inflammation. In his textbook (1893) Gruber stated that the outcome in the reported cases of sarcoma was always fatal, the growth being rapid. In cases of epithelioma recovery was reported when the growth could be radically removed. This observation is in line with Dr. Schall's suggestion of radical mastoidectomy before the application of radium. Dr. Pfahler reported 2 cases in which there was recovery, 1 of epithelioma and 1 of sarcoma treated with radium alone.

Dr. Joseph Beck, Chicago: It is important not to confuse these neoplasms with the malignant lesions of the ear external to the isthmus. In other words, there are many cases of carcinoma and epithelioma of the external ear or even of malignant growth within the concha. In cases of a neoplasm arising from the region between the isthmus and the middle ear, it is impossible to make a clinical diagnosis of the condition of the middle ear. I have observed 2 cases of malignant tumor of the middle ear in more than thirty-five years. One occurring prior to knowledge of roentgenography as an aid in diagnosis or treatment was a case of malignant hemendothelioma, in which facial paralysis was the first symptom. In the second case, a recent one, the management was exactly as Dr. Schall indicated. He has spoken of the method of attack, and he has several pictures. I think he could do no better than to show some illustrations of the method of procedure. I should like to know whether his patients are still alive five years from now. Four years is a splendid record, but not a sufficiently long period when one is speaking of complete recovery. The patients are still young.

Dr. George M. Coates, Philadelphia: No physician sees enough of these patients and in a sufficiently short period to elaborate satisfactorily the technic of the management of the condition. Dr. Schall has been fortunate in seeing 6 in a comparatively short time and in working out his method of treatment. It is probably true that growths internal to the isthmus cannot be entirely differentiated from those of the middle ear only. And it is also true that some neoplasms arising just outside the isthmus and extending in and past the isthmus fall more or less into the same category. There can be no question that the more radically a growth of this type is removed in any part of the body the better the chance of success, and Dr. Schall's method seems to offer a first-rate opportunity of getting rid of these growths before they have progressed too far. I have had a case of a growth that originated near the isthmus and extended inward. I do not think that it could be classified as growing outward from the middle ear. The growth was removed as completely as possible by electrocoagulation followed by irradiation, a procedure which Dr. Schall condemns, for the deeper growth at any rate, and properly, I think. This case occurred two or three years ago, and the patient is still alive and without evidence of recurrence at present. Another growth was deeper. It was classified as a malignant condition of the bony canal with probable involvement of the middle ear. This patient underwent a radical mastoidectomy, followed by irradiation, and as far as I know, although I have not seen him for a year or more, he is still alive. I think a biopsy is of the utmost importance in every case in which neoplasm is suspected, and probably should be suspected in many more instances than it is. When the patient comes into the dispensary with a chronic discharge of the ear, polyps or granulating tissue, it is easy to forget that a malignant process is possible. So many growths are seen which are not malignant that I am afraid one may overlook those that are. In my 2 cases the process was in a very early stage. I may have overlooked some in which the disease was more advanced.

Dr. Frank Spencer, Boulder, Colo.: Benign polyps are less likely to bleed. These are seen rather frequently; the malignant ones, rarely. Hemorrhages or bleeding polyps should arouse suspicion; they demand thorough microscopic study. As one member remarked, one is likely to neglect a tumor which is believed to be benign, and in that one is careless. Swelling of the external auditory canal after the removal of a polyp which persists in spite of treatment should put one on guard. Prolonged treatment only delays the proper diagnosis and makes prolongation of life by a radical operation less likely. Radical surgical intervention for the middle ear and mastoid offers the best means of prolonging life, especially

if surgical treatment is followed by high voltage roentgen therapy or radium therapy or both, depending on the judgment and experience of the radiologist. I have had a case of carcinoma of the middle ear and have observed the treatment employed by my colleagues in several others. All these instances represented late stages; that is, the patient was not seen by an otologist until late in the disease. I want to stress the point that diagnosis is too often made late, not always by an otologist but because the attending physician believes that hemorrhage signifies only benign granulations.

DR. LEROY A. SCHALL, Boston: In response to Dr. Beck's request, I will show the slides of my operative procedure. I included them in my original paper but eliminated them in order not to confuse the issue. My paper deals with neoplasms of the middle ear, not methods of operation.

GLOSSODYNIA: REFLEX IRRITATION FROM THE MANDIBULAR JOINT AS THE PRINCIPAL ETIOLOGIC FACTOR

STUDY OF TEN CASES

JAMES B. COSTEN, M.D.
ST. LOUIS

During the observation of ninety patients with neuralgia and aural symptoms associated with destruction and disturbed function of the temporomandibular joint, ten were found to have burning pain about the tongue and pharynx. One varied the description to a "prickling sensation along the margin of the tongue." Complete relief was obtained in most of these patients after repositioning the lower jaw to increase its vertical dimension and bring the condyle out of range of the auriculotemporal and chorda tympani nerves. The relationship and reflex path for the pain seem clear.

Prinz and Greenbaum [1] have stated very recently that nothing definite is known of the cause of glossodynia, ascribing it to endocrine disorders, disturbances of the reticulo-endothelial system and to abnormal acid conditions of the stomach. The relationship of gumma in cases of syphilis involving the central nervous system is obvious from the relief experienced after antisyphilitic treatment. It is interesting, however, to note how frequently glossodynia has been described in the earlier medical literature without any definite accounting for the etiology.

Butlin,[2] in 1885, described "lingual neuralgia" as of idiopathic origin, with pain along the distribution of the lingual and glossopharyngeal nerves and, in one patient, "behind the anterior half arches of the palate as the chief seat of suffering." He stated that the pain, sharp and lancinating, grinding or aching, "may occur in paroxysms, with intervals of complete ease; but it is more commonly persistent, although it is apt to be aggravated by every movement of the tongue, whether in eating or in speaking." Quoting further:

> There can be little doubt that the tongue may be the seat of rheumatic pain, for Chomel has recorded an unequivocal instance . . . the pain was seated in

From the Department of Otolaryngology, Washington University School of Medicine, and the Oscar Johnson Institute.

1. Prinz, H., and Greenbaum, S. S.: Diseases of the Mouth and Their Treatment, Philadelphia, Lea & Febiger, 1935, p. 459.

2. Butlin, H. T.: Diseases of the Tongue, London, Cassel & Co., Ltd., 1885, p. 417.

the tongue, but was prolonged into the pharynx. It was very sharp, increased by every movement of the tongue, and very much augmented by deglutition. . . . the rheumatic nature of the pain rested on the fact . . . that she was suffering from articular rheumatism at the time of the affection of the tongue, and that the tempŏro-maxillary articulation was attacked two days before the tongue. The sudden onset and disappearance of the pain also pointed its rheumatic character.

Treatment, according to Butlin, was effected variously by applications of menthol to the surface of the tongue, by division, excision or stretching of the lingual nerve, and by the use of the faradic or galvanic current along the course of the nerve.

According to Blair:[3]

The tongue is well supplied with sensory nerves for both taste and common sensation. Tactile sensation is more acute on the tip than on any other part of the body. The sensory supply of the pharyngeal surface and the circumvallate papillae is through the glossopharyngeal nerve from fibers originally derived from the trifacial. This latter nerve supplies also the oral part of the organ directly through the lingual. The taste papillae on the tip, sides and dorsum probably send their afferent fibers through the lingual and chorda tympani nerves. Painful affections of the tongue in the area supplied by the lingual nerve may be accompanied by severe neuralgia deep in the meatus of the ear through the connection of the fifth nerve with the seventh or it may be over the terminal branches of the fifth.

Brown,[4] briefly referred to abnormal function of the temporomaxillary articulation as a source of pain:

Examination of skulls in the cadaver and dried specimens as well as observation and study of the movement of the condyles shows great variation in size and form of the glenoid cavities of different individuals and often on the two sides of the same individual . . . it may also become an influential factor in the production of pain . . . there are many cases on record in which trigeminal neuralgia has been relieved by the insertion of suitable plates to hold edentulous jaws sufficiently apart to keep the condyloid and coronoid processes of the lower jaw in right relation to the surrounding parts.

Eleven cases of "burning tongue" were observed by Engman.[5] He described the condition as a subjective one with no gross lesion except enlargement of the normal papillae; the patients were "terror stricken for fear of carcinoma of the tongue." He referred to the observation of Sluder[6] "that lingual tonsillitis may play a causative part as a factor in painful tongue."

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3. Blair, V. P.: Surgery and Diseases of the Mouth and Jaws, St. Louis, C V. Mosby Company, 1912, p. 11.

4. Brown, G. V.: The Surgery of Oral Diseases and Malformations, Philadelphia, Lea & Febiger, 1912, p. 321.

5. Engman, M. F.: "Burning Tongue," Arch. Dermat. & Syph. **1**:137 (Feb.) 1920.

6. Sluder, G.: Some Clinical Observations on the Lingual Tonsil, Concerning Goitre, Glossodynia and Focal Infection, Am. J. M. Sc. **156**:248 (Aug.) 1918.

Under the heading "Neuralgia and Pain in the Tongue," Mead [7] asserted:

A large proportion of the sensory nerve disturbances of the mouth are attributable to referred pain arising from terminal nerve irritation in the teeth, gums, tongue, or mouth . . . changes affecting the nerve endings of the fifth nerve anywhere along its distribution may be referred to some other connections of the nerve . . . referred pain to the tongue may be caused by affections of the thyroid gland . . . many patients complain of painful, indefinite sensations in the tongue, for which no cause can be found.

Oppenheim [8] describes "burning tongue" as follows:

This symptom—it is doubtful whether we call it an independent disease—consists in parasthesiae, generally a burning, prickling sensation, confined to the tongue or extending to the mucous membrane of the cheeks, jaws, or lips. It may occur in paroxysms or be constantly present, and it may disturb sleep. It is not on the whole a very common symptom, and generally affects women of advanced age. The teeth are almost always absent. The sufferer is usually of a neuropathic constitution . . . in several cases cancerphobia, i. e., fear of cancer, was present, but it was impossible to decide whether the fear was the cause or the effect of the paraesthesiae. There were no objective symptoms . . . . pain in the tongue may appear in the initial stage of tabes, and paralytic dementia. . . . Glossodynia should be chiefly treated by psychotherapy.

Grinker [9] states: "Burning sensations are common in arteriosclerosis of the vessels of the tongue."

REPORT OF CASES

The patients in the following cases gave the history of "burning tongue" in addition to the other complaints for which they were studied. For brevity the results of the general examinations will be noted in detail only when relevant to the neuralgia.

Case 1.—Mrs. A. K., aged 62, for many years had a "raw" feeling in the right side of the throat. She had headache daily over the right eye, behind the right ear and in the occiput. At the end of the day there was a burning sensation in the right side of the nose and tongue which extended at times to the right ear. She had no deafness or dizzy spells.

She was examined on July 24, 1928. The nasal spaces were clear of infection. The lower turbinates were enlarged but not occlusive. In the nasopharynx the right eustachian tube was set forward by a smooth mass about 0.5 cm. in diameter. The mucosa on the surface was not broken. The mass was soft in texture. The pharynx was otherwise normal. The upper and lower molars on the right side were absent. Hearing tests showed normal hearing with bone conduction slightly prolonged. Biopsy of the mass was suggested and refused.

7. Mead, S. V.: Diseases of the Mouth, St. Louis, C. V. Mosby Company, 1927, p. 233.

8. Oppenheim, H.: Textbook of Nervous Diseases for Physicians and Students, translated by A. Bruce, ed. 5, Edinburgh, O. Schulze & Co., 1911, p. 1200.

9. Grinker, R. R.: Neurology, Springfield, Ill., Charles C. Thomas, Publisher, 1934, p. 354.

The diagnosis was: chronic right sphenoiditis; chronic secondary pharyngitis; nasopharyngeal tumor on the right side (?).

On Oct. 2, 1933 the patient returned. Biopsy was made, and the sections were reported as showing chronic inflammation and lymphadenoid tissue. The mass was still soft and not increased in size. All the molars on the right side, upper and lower, were missing. The right temporomandibular joint was tender to firm pressure, and closure of the jaws as in biting showed slipping of the jaw to the left with wrenching of the right joint. The soft mass in the nasopharynx, observed through the nasopharyngoscope, was seen to bulge markedly on closure of the jaws.

The patient was sent to her dentist, and upper and lower dentures were fitted into the molar spaces on the right. The last report from her, three weeks later, indicated that there was marked relief from the headache and burning sensation.

CASE 2.—Mrs. W. H. B., aged 33, referred by Dr. G. D. Royston, was just beginning her allergic reaction to the fall grasses. In addition to the usual symptoms of sneezing, watery discharge and obstruction of the nose she had regularly a dull headache localized about the ears and radiating to the cheek bones. This daily pain became severe by the end of the day. A burning sensation radiated to the right ear. The onset corresponded with extraction of the lower molar teeth six months before.

She was examined on July 30, 1932. The nasal spaces showed allergic reaction; the throat was normal. The tonsils had been removed. Much dental work had been done. The lower molars on both sides were missing, and the lower incisors closed behind the uppers with an extreme overbite.

The diagnosis was: headache from overaction of the mandibular joint; extreme overbite of the jaws; allergy.

On May 20, 1933, the patient returned with the headache more severe. No trace of her seasonal allergy was seen in the nose. She complained of a "full feeling" in the right ear. The examination gave negative results. The eustachian tube was normal. She was again urged to have a proper fitting of the jaw teeth, and this time she did. About one month later, on July 2, she reported that all of her headache had disappeared. It did not return with her hay fever in the fall. On March 1, 1935, she reported that after tedious efforts to reposition the jaw she had no further burning pains.

CASE 3.—Mrs. S. F., aged 58, was treated by Dr. G. Sluder for nasal infections. She had no further trouble for a number of years. Then she began to have burning in the throat and sides of the tongue. She had morning headaches, an entirely different type of pain, located about the eyes and in the cheeks. There was also pain about the ears. These symptoms improved as the day proceeded.

Examination on July 11, 1934 showed a mild rhinitis. The ears were normal. The upper teeth were absent and she used a plate. There was no plate below, but all the lower molars had been extracted, permitting a wide overbite The mandibular joints were extremely painful to internal palpation. The condyles were seen to weave and snap on closure of the mouth.

The diagnosis was: hyperplastic rhinitis and mandibular joint syndrome.

She was referred to her dentist, who fitted her mouth with new plates, and she was completely relieved of the headache and lingual pain in three weeks.

CASE 4.—Mrs. E. McM., aged 52, was observed in the outpatient clinic and in Barnes Hospital from Sept. 2, 1933 to Oct. 5, 1934. Her record was voluminous. The following abstract was made by Dr. Robert Votaw, who enabled me to examine her.

On Sept. 2, 1933, she came to the clinic with complaints of "piles, constipation, burning in the mouth and on both sides of the tongue severe enough to disturb her sleep at night"; she contemplated suicide because of the constant burning in her mouth and pain in the top of her head; there was occasional stoppage of the left ear.

On September 20, after routine study of her condition in the clinic for gastro-intestinal diseases and in the neurologic department, it was diagnosed as anxiety neurosis, achlorhydria, constipation and hemorrhoids. All blood, serologic and urinary studies gave negative results. Hydrochloric acid, an anticonstipation diet, liquid petrolatum and sodium bromide were prescribed. Temporary relief of the left ear was afforded by inflation of the eustachian tube.

On November 7 a gastro-intestinal fluoroscopic series was made following a barium sulphate meal. She was suspected of having pernicious anemia because of the burning tongue. There were no atrophies or blood changes. During this observation she requested hemorrhoidectomy because she had a friend whose burning mouth was relieved by this procedure.

On December 19 she was admitted to Barnes Hospital and hemorrhoidectomy was done. In consultation with the department of otolaryngology the burning pain was temporarily relieved by cocainization of the lingual nerve in the floor of the mouth; after similar treatment of the sphenopalatine ganglion no change was shown. Numerous mouth washes were prescribed.

On March 7, 1934, after roentgen study, she was given a diagnosis of normal gallbladder and gastric motor insufficiency. The conditions underlying other complaints were indeterminate.

On July 22, on her return to the department of otolaryngology, she was suspected of having the mandibular joint syndrome. She was noted to have worn flat upper and lower dentures with a wide overclosure. The dentures had been worn two years but fitted poorly, and the pain was worse after the dentures were obtained. The patient had noted that she could get relief by holding the mouth open or by wearing corks between the teeth. All symptoms of pain were aggravated by talking or chewing. Both mandibular joints were extremely tender to internal palpation, and the condyles were seen to weave and snap on closure of the mouth. New dentures increased the vertical dimension of the jaw 14 mm.

In October she reported several times that she was completely relieved.

Case 5.—Mrs. A. S. aged 42, was examined on Sept. 25, 1933. She gave a history of throbbing pain in the right temple beginning in 1928, for which both sphenoid groups were resected. The pain changed to the right occiput, where it remained, with a burning spot on the skin, "sore as if blistered," disturbing her sleep. Two years ago she had a Caldwell-Luc operation followed by regular nasal treatment, without relief. Her weight was reduced from 115 pounds (52.1 Kg.) to 90 (40.8 Kg.) because chewing radiated a burning pain along the right side of her tongue. Menstruation ceased at the time of her first nasal operation.

Examination showed the ears normal; fork tests gave negative results. The nose showed evidence of a radical removal of all the posterior sinuses and a window in the right antrum.

The diagnosis was: hypogonadal headaches; postoperative nasal scars; allergy (?); glossodynia.

After cocainization of both nasal ganglions, she was returned to her physician for study and possibly endocrine gland medication.

On Nov. 2, 1933, she reported that she had had no relief from the nasal treatment and no improvement after one month of endocrine gland medication. It was

noted that she wore very flat dental plates which permitted wide overclosure of the lower jaw. The right mandibular joint was extremely tender. New plates and repositioning of the lower jaw were advised but delayed. This work was finally done in November 1934 and two months later she was entirely relieved of the pain in the head and tongue and had gained 10 pounds (4.5 Kg.).

CASE 6.—Mrs. M. D. aged 44, was referred by Dr. A. R. Anneberg after continued study and treatment in the outpatient clinic. She gave a history of a discharge from both ears since childhood. Her headaches over a number of years were originally frontal and later occipital; the pain was present mornings and became worse toward the end of the day; during the past year she also had a burning pain deep in the neck and throat and along the margins of the tongue.

After six months' observation in the department of general medicine and that of otolaryngology she submitted to a radical mastoid operation on the right side because of an acute exacerbation of her chronic otitis (Feb. 18, 1934). On May 5 windows were made in both antrums because of her chronic maxillary infection. The results of both operative procedures were good, but her headache, occipital and frontal, persisted, as well as the burning pain in the tongue. The frontal headache could be relieved by application of cocaine to the middle meatus, but 5 per cent cocaine applied to the nasal ganglion failed to relieve the occipital headache.

A refractive error of the eyes was corrected, the posterior sinuses were treated by displacement, and a course of treatment with anterior lobe pituitary extract was given, without marked improvement.

It was then noted that all the molar teeth were missing and that the temporomandibular joints were extremely tender. The jaws closed with marked overbite. She was referred for extraction of carious snags, and proper dental plates were obtained on June 1, 1935. There was immediate relief from the occipital headache and pain in the tongue, and there was only a trace of the frontal pain when the nose was obstructed.

CASE 7.—Mrs. I. R., aged 49, referred by Dr. Roland Klemme, had a painful tic in the right side of the face for about eight years. The pain began with cramping jabs of pain about the right eye, cheek, throat and side of the tongue and in front of the right ear. Injections of alcohol at intervals of from six to nine months were tried, and finally resection of the posterior root four years ago. The major tic was reduced, but there persisted a constant pain about the right eye and into the root of the nose and burning pains in the right side of the tongue and throat. She had had plates fitted after the operative work, but did not wear them. She had frequent attacks of fine "canker sores" on the buccal mucosa and hard palate.

Examination showed the nose and ears normal. The jaw overclosed on inadequate plates, and as it opened the condyles, which had shifted to the left on closure, wove in the loose joint capsule. The right mandibular joint was extremely tender to palpation. A group of small herpetic spots covered the mucosa of the right lower lip.

The diagnosis was: postoperative major tic; atrophy of the muscles of the right side of the face; overbite with neuralgia from irritation about the right mandibular joint; herpes.

On June 27, 1935, it was found that, as instructed, she had worn the dentures since her last examination. When asked concerning relief from pain she would not admit that there had been improvement but said that she had pain only about the right eye; there was no further complaint of burning tongue or of pain in other areas. Interposing 4 mm. of test disks increased the comfort in the right

side of the jaws, and she was returned to her dentist for further increase in the vertical dimension.

CASE 8.—Mrs. S. S., aged 64, was referred by Dr. L. Sale because of headache and burning tongue. She had been under his care a number of years for dietary control of diabetes. For the past ten years she had had a dull pain in the right temple growing worse during the day. There was also a constant burning and "metal taste" along the right side of the tongue. She had stoppage of the ears with tinnitus. The dental plates were fifteen years old.

Examination showed the nose and throat normal, the ear drums dull and retracted. The mandibular joints were very loose and were seen to weave on motion of the lower jaw even externally. Internal palpation of the joints showed the right one extremely tender. Test disks measuring 6 mm. instantly gave her relief from the headache and lingual pain.

The diagnosis was: mild diabetes; glossodynia on the right side; overbite with destruction of the mandibular joints and consequent neuralgia.

On April 1, 1935 she reported all symptoms improved after the jaw had been repositioned with new plates for one month.

CASE 9.—Mrs. A. H., aged 39, referred by Dr. L. W. Dean, gave a history of a drawing sensation in both ears, most marked in the left, with flashes of burning pain into the left wall of the throat, hard palate, cheek and tongue. The attacks were sudden, worse toward the end of the day, and could be brought on by chewing gum. At other times the pain was relieved after eating certain foods. She had been under the care of Dr. R. P. Scholz for various sinus infections for some years. Roentgen studies by Dr. Sherwood Moore showed the capsule loose, with definite abrasion of the left condyle.

Examination on May 17, 1935 showed the nose clear of infection and the throat normal. Most of the molar teeth were missing, which allowed a marked overbite, and as the jaws closed the incisors slipped backward and to the right with a movement of the left condyle to the right when the jaws were completely closed. The mandibular joints ground noisily on closing and were quite tender. Test disks between the jaws relieved the burning in the left side in twenty minutes and all of her pain in one hour and forty-five minutes. She was referred to her dentist for proper support to the lower jaw and increase of its vertical dimension.

CASE 10.—Mrs. E. M., aged 38, referred by Dr. H. L. Alexander, was studied completely in the department of internal medicine, and the findings were entirely negative except for neuralgia deep in the ears, extending into the left side of the neck, and a prickling sensation along each border of the tongue, these symptoms becoming worse toward the end of the day. The symptoms were of two years' standing. She associated the attacks with chewing solid food. She had had some nasal treatment with temporary relief; fitting of glasses gave no relief.

Examination showed the nose normal except for low deviation of the septum. The throat and ears were normal. There was definite malocclusion, and the absent molars were replaced by bridges. The mandibular joints, especially the left, were extremely tender to palpation. Externally, when the mouth was open, the condyle could be seen to pass forward completely into the soft tissue of the pterygoid fossa, dimpling the skin deeply in front of the ear. Interposing test disks of 4 mm. between the jaws on the left resulted in disappearance of all pain about the ear and tongue. During the test the patient remarked that she had had no saliva for years, and with the jaw supported only a few minutes the saliva returned.

The diagnosis was: neuralgia from destruction of the mandibular joints; glossodynia; malocclusion; deviation of the septum to the right.

COMMENT

The series from which these cases are taken comprises ninety examples of neuralgias and disorders of the ear which show some or all of the symptoms previously described [10] as a mandibular joint syndrome: (*a*) intermittent impairment of hearing with a sensation of the ears being stopped, tinnitus and dizziness, relieved by inflation of the eustachian tubes; (*b*) headache in the vertex and occiput and deep around the ears, and burning sensations in the walls of the throat and in the sides of the tongue and of the nose; later [11] (*c*) herpes of the external canal of the ear and buccal mucosa on the side of the neuralgia in about 25 per cent of the cases.

All the patients showed some form of malocclusion with consequent destructive change in the mandibular joint.

Anatomic reasons [12] for the symptoms of the ear were shown in the effect of overclosure of the jaws on the eustachian tubes by compression of the soft tissues. This was demonstrated by section and by manipulation of soft cadaver specimens.

The painful reactions were explained as the result of (*a*) deep erosion of the bone in the floor of the glenoid fossa and impaction of this thin area next to the dura, (*b*) pressure on the auriculotemporal nerve by the condyle in its loose motion and (*c*) irritation of the chorda tympani nerve as it passes within the edge of the glenoid fossa.

The fact that ten cases of "burning tongue" have appeared in a series of ninety cases of pathologic conditions of the mandibular joint warrants the assumption that the pain in the tongue is produced reflexly by the pressure of the condyle on the auriculotemporal nerve with reference of the pain along the lingual nerve.

The posterior portion of the mandibular nerve or third division of the trigeminus nerve divides into three large branches: the lingual, the auriculotemporal and the inferior alveolar. These are sensory except for a strand of motor fibers in the inferior alveolar branch, which compose the mylohyoid nerve. The lingual branch is the most anterior and supplies the anterior two thirds of the tongue. The inferior alveolar (dental) nerve is the next and largest branch, and supplies the canine and incisor teeth and the corresponding region of the gums. The auriculotemporal branch arises from the posterior portion of the mandibular nerve by two roots which embrace the meningeal artery and

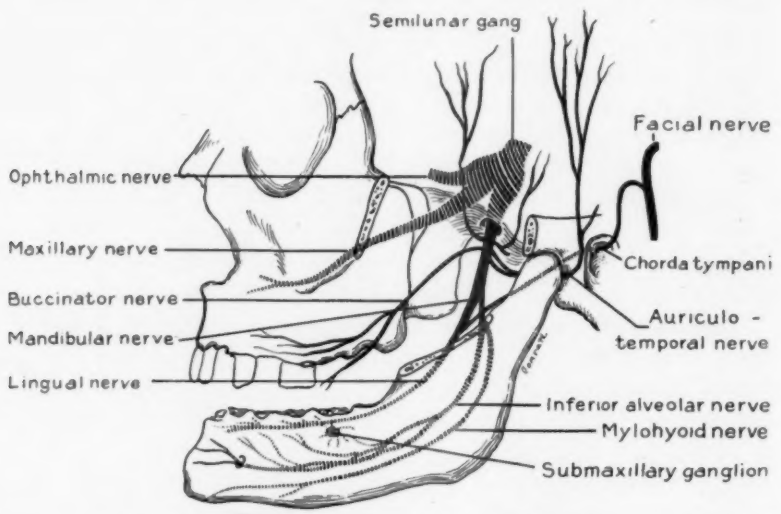
10. Costen, James B.: A Syndrome of Ear and Sinus Symptoms Dependent upon Disturbed Function of the Temporomandibular Joint, Ann. Otol., Rhin. & Laryng. **43**:1 (March) 1934.

11. Costen, James B.: A Group of Symptoms Frequently Involved in General Diagnosis, Typical of Sinus and Ear Disease and of Mandibular Joint Pathology, J. Missouri M. A. **32**:184 (May) 1935.

12. Costen,[10] p. 5.

unite behind it to form the trunk of the nerve branch. It passes backward on the inner aspect of the external pterygoid muscle and between the sphenomandibular ligament and the temporomandibular articulation, lying in close relation with the capsule of the joint. Behind the joint it enters the upper part of the parotid gland, through which it turns upward and outward. Its distribution upward corresponds almost exactly to the district to which the pain of inflammation of the sphenoid sinus is referred. It gives off small branches to the capsule of the joint, the external auditory meatus and the parotid gland.

The chorda tympani nerve, an important branch of the seventh nerve, is given off in the facial canal, leaving the trunk of the seventh nerve a short distance above the stylomastoid foramen and passing



Schema to show the various areas supplied by the fifth nerve. Reflex pains initiated by irritation of the auriculotemporal and chorda tympani nerves are expressed in these areas. Pain in the tongue occurs along the course of the lingual nerve. Various sensory disturbances arise in the region supplied by the chorda tympani.

upward and forward in the posterior wall of the tympanic cavity. Within the cavity it runs behind the upper third of the tympanic membrane, leaving it by way of the iter chordae anterius at the inner end of the petrotympanic fissure.

Thus the auriculotemporal nerve has ample chance of impaction by the condyle in a loose joint which has been destroyed through the lack of molar support in an edentulous mouth or through the uneven pressure permitted by maloccluding natural teeth. The tendency of the joint to be destroyed on its weakest margin, i. e., mesially and forward, was

noted and illustrated [13] as producing the mechanism for further play in the joint. Impaction backward, upward or in any direction catches a portion of the auriculotemporal nerve in its course between the condyle and the tympanic plate. Strong irritation of this branch is therefore afforded and reflected to the areas supplied by its terminal branches (deep within the ear, about the ear and in the region of the vertex), to the area supplied by the lingual branch (anterior two thirds of the tongue) and to the area supplied by the inferior alveolar branch (lower incisors, canines, gums and jaw).

After the condition of pathologic joint is suspected as the source by the appearance of malocclusion, overclosure or lack of molar teeth, and palpation of the joint internally [14] shows it to be extremely tender, the diagnosis can be further confirmed by interposing small test disks between the jaws for short periods of time. The effect on the neuralgic pains if they are from irritation by the joint is marked relief from the burning in from ten to forty minutes. The relation can be repeatedly proved by giving the patient a number of cork disks, 2 mm. in thickness, with the instruction to place them between the jaws during various attacks and note changes in the pain. The degree of change in a joint which is extremely loosened can be noted when the patient opens and closes the mouth.

Movement of the condyle mesially in the more marked type of loose joint seems to offer the best chance of irritating the chorda tympani nerve. Since its function is chiefly gustatory, one expects to find sensory disturbance rather than pain effects from irritation. The patient in case 8 described "metal taste" and the patient in case 10 "prickling sensation," with and without burning. How much reflex irritation is passed along the chorda tympani and auriculotemporal nerves by way of central nuclei or by way of sympathetic ganglions to the glossopharyngeal nerve awaits further study of cases in which the disorder is diagnosed as glossopharyngeal neuralgia.

The treatment of "burning tongue" has been surgical, as noted early by Butlin,[2] applied to the lingual nerve, and palliative, with use of electric stimulation, cocaine (injected into the lingual nerve in the floor of the mouth) and general measures. Dean [15] and later Sluder [16]

13. Costen,[11] figure 9.

14. Costen, James B.: Neuralgias and Ear Symptoms Involved in General Diagnosis Due to Mandibular Joint Pathology, J. Kansas M. A. **36**:315 (Aug.) 1935.

15. Dean, L. W.: The Control of Glossodynia, South. M. J. **15**:856 (Oct.) 1922.

16. Sluder, G.: "Lower Half Headache" (Neuralgic) of Nasal Origin: Glossodynia, Otalgia, Nausea, Parageusia, Vertigo, Scotoma, Photophobia, Rhinorrhea and Asthma as Isolated Phenomena, J. A. M. A. **79**:1898 (Dec. 2) 1922.

reported numerous cases in which the pain was relieved by injection of alcohol into the nasal ganglions. Neurologists recognizing the common attitude of cancer phobia recommended psychotherapy. Antisyphilitic treatment is indicated when the pain is of that origin.

SUMMARY

Ten cases are presented from a large group showing pathologic conditions of the mandibular joint due to various kinds of malocclusion. The chief complaint in each of these cases was of "burning tongue" or glossodynia.

In each of these cases, during the examination, the pain was partially or completely relieved when the condyle was moved away and downward from the joint by interposing test disks between the jaws. The thickness of the disk pack was judged grossly by the looseness of the lower jaw. No other treatment was used in the tests.

The success with which permanent relief was obtained depended on the chance of perfect repositioning of the jaw by dentures which increased its vertical dimension and moved the condyle away from the range of the chorda tympani and auriculotemporal nerves.

Irritation of these nerves, especially the auriculotemporal, sufficient to produce reflex pains in the remaining branches of the mandibular nerve is proposed as the principal etiologic factor in the production of "burning tongue" or "neurosis of the mouth" without gross lesions.

722 Beaumont Medical Building.

EVALUATION OF CALORIC TESTS IN LOCALIZATION OF LESIONS OF THE POSTERIOR FOSSA

A STUDY OF FORTY VERIFIED CASES

JACOB L. MAYBAUM, M.D.
AND
MORRIS GROSSMAN, M.D.
NEW YORK

The object of this communication is, first, to evaluate, if possible, the aid that can be obtained for localization of lesions in the posterior fossa by a study of the caloric responses obtained in cases of such lesions and, secondly, to compare the accuracy of such localization with that suggested by a study of the clinical findings in each case.

For the purpose of this study we have used cases in which the diagnosis has been verified either by operation or at autopsy and in which the caloric tests were performed by members of the otologic staff of the hospital. We regarded as "verified by operation" only those cases in which the pathologic process was seen or removed by the surgeon; "verified by autopsy" refers only to macroscopic observations made post mortem. We have no evidence as to what the effects of these lesions were on the various pathways, as would be shown if serial sections had been made for the purposes of finer localization.

The entire material was selected from the various services and the neuropathologic laboratory of the Mount Sinai Hospital. The group consists of twenty-two cases of cerebellar lesions (twenty neoplasms, one hemorrhage and one tuberculoma of both cerebellar lobes), seventeen cases of tumor of the pontile angle and one of neoplasm of the pons.

The first group to be discussed will be the cases of cerebellar lesions. There were twelve males and ten females. The ages varied between 3½ and 53 years. The duration of illness before admission to the hospital varied between six weeks and four years.

The most common symptom in this group was headache. It was the initial complaint in eighteen cases. In nine cases the headache was accompanied by nausea, vomiting and vertigo, and in nine others,

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Read at the meeting of the American Otological Society, Toronto, Canada, May 29, 1935.

These patients were observed in consultation with the neurologic staff of Dr. I Strauss at the Mount Sinai Hospital and studied by the otologic staff of Dr. I. Friesner.

by nausea or vomiting alone. In three cases ataxia was the first symptom noted; in two others the first sign was diplopia, and one patient stated that vertigo unassociated with headache or vomiting was the first symptom.

On examination of the vestibular apparatus we tested not only the internal ear but also a large portion of the central nervous system. We could determine the intactness of the internal ear and of the eighth nerve as well as of the various afferent pathways and the intracranial structures through which these fibers pass. From these tests we were in a position to state whether the lesion was peripheral or central and, if central, where it was located. In many cases the findings are helpful in reaching a fairly definite localization, especially if studied as they should be, in conjunction with the findings of a neurologist. Levitt[1] expressed the opinion that the term Bárány tests should be discarded for "examination of the vestibular apparatus," in other words, the examination of a definite anatomic entity.

In all instances the caloric tests were used instead of the turning tests, as the information obtained from the former is more accurate and reliable since each semicircular canal is tested separately. It must be remembered that the vestibular tests are used as an aid in the localization of a lesion and not in the determination of the nature or type of the lesion present. Our conclusions or impressions as to localization were arrived at independently of the neurologic findings. The vestibular findings elicited by means of the caloric tests are influenced, aside from the presence of the lesion itself, by the question of the degree of intracranial pressure and also by whether or not and to what degree the patient cooperates. To obtain a fair degree of proficiency in the proper evaluation of these tests it is necessary to study as many cases as possible, to standardize the technic carefully and to interpret the findings conservatively and accurately. After the vestibular findings have been noted as carefully as possible, the next step is to analyze these findings and determine by means of knowledge of the vestibular pathways a presumptive localization. Up to the present time our knowledge of these pathways has been based on clinical experience, the result of many examinations and correlative studies of neurologic, operative and postmortem observations.

The clinical sphere of application of the caloric test is as follows:

1. It is a valuable and positive method of ascertaining the degree of viability of the labyrinth.

2. It aids in the diagnosis of the presence or absence of a lesion of the cerebellopontile angle.

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1. Levitt, F. C.: The Evaluation of the Vestibular Examination in Intracranial Localization, Ann. Otol., Rhin. & Laryng. **34**:574 (June) 1925.

3. It permits an early diagnosis of actual or threatening intracranial invasion in cases of acute or chronic suppuration of the middle ear.

4. In cases of neurologic disturbances in which clinical findings are vague, a vestibular examination will frequently elicit definite evidence of an intracranial lesion which would serve to put the neurologist on his guard. When the general neurologic picture is confusing and differentiation between a subtentorial and a supratentorial lesion is not clear on neurologic grounds, a vestibular examination may help in such differentiation. Occasionally it is possible by these tests either to localize the side on which the lesion is present or to help even more definitely in localization.

5. A wide field of application for the tests lies in the diagnosis of the cause of vertigo.

A knowledge of the intracranial pathway of the vestibular nerve, as understood by us at the present time, is important in the proper evaluation of the findings on caloric examination.

In recent years Grahe,[2] Brunner [3] and Kobrak [4] have made detailed studies of cochlear and vestibular examinations and their importance in the recognition of intracranial disease.

Ramón y Cajal has shown histologically that fibers from the vestibular portion of the eighth nerve enter Deiters' nucleus and continue through the inferior cerebellar peduncle into the cerebellum.

The nerve pathways or vestibular tracts have not been entirely defined. From anatomic and physiologic studies and from operative and postmortem observations, these tracts may be said to have a definite course from the labyrinth to the cortical center, supposedly located in the first and second convolutions of the temporosphenoid lobe near the cortical center for hearing. From the various end-organs within the labyrinth, namely, Corti's organ of the cochlea, the maculae of the utricle and saccule and the crests of the three semicircular canals, nerve fibers enter the internal auditory meatus, where they unite in one common bundle to form the eighth nerve. At the point of entrance of the eighth nerve into the medulla oblongata the nerve fibers again divide into two main trunks, namely, the auditory and vestibular portions. The auditory fibers divide into an anterior and a posterior tract. The vestibular fibers divide into fibers of the horizontal canal and those of the vertical canals.

2. Grahe, Karl: Hirn und Ohr, Leipzig, Georg Thieme, 1932.

3. Brunner, H.: Allgemeine Symptomatologie der Erkrankungen des Nervus Vestibularis, in Alexander, G., and Marburg, O.: Handbuch der Neurologie des Ohres, Berlin, Urban & Schwarzenberg, 1924, vol. 1, p. 940.

4. Kobrak, F.: Oto-neurologische Diagnostic, Monatschr. f. Ohrenh. **64**:947, 1930.

The original investigations of the vestibular pathways by Jones[5] have been a valuable aid in their localization of intracranial lesions by means of the vestibular tests.

According to Jones,[5] the fibers from the horizontal canal and those from the vertical canals have a different course within the brain stem. The fibers from the horizontal canal go to Deiters' nucleus in the upper part of the medulla and there divide into two separate tracts. The

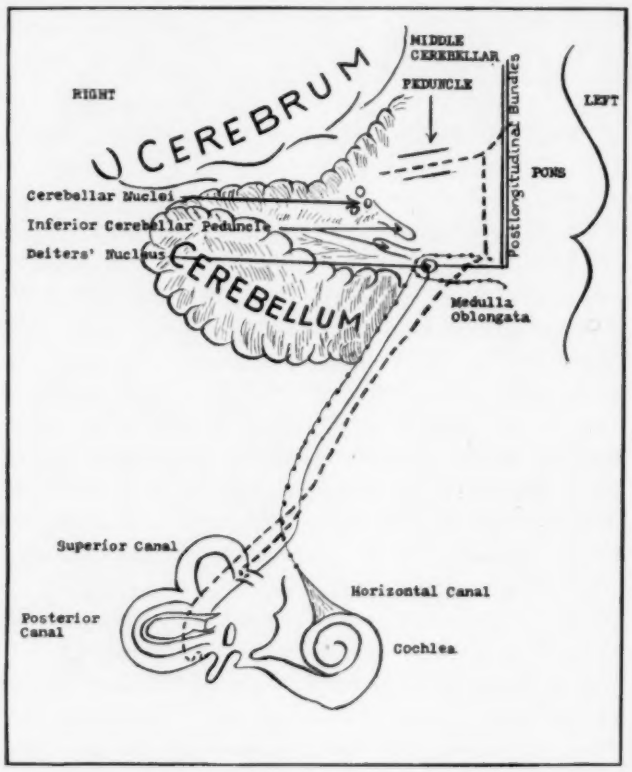

Fig. 1.—A diagram of the view from the front, showing the pathways of fibers from the cochlea and the horizontal and vertical canals. (This illustration and figure 2 were copied from Jones, I. H.: Equilibrium and Vertigo, Philadelphia, J. B. Lippincott Company, 1918.)

vestibulocerebellocerebral tract ascends by way of the juxtarestiform body in the inferior cerebellar peduncle to the dentate nucleus in the cerebellum. The vestibulo-ocular tract ascends to the posterior longitudinal bundle and goes to the nuclei of the third and sixth nerves in the pons. The fibers from the vertical canals ascend into the pons and

5. Jones, I.: Equilibrium and Vertigo, Philadelphia, J. B. Lippincott Company, 1918.

divide into two tracts. The exact location of this point of division is not known. The vestibulocerebellocerebral tract goes to the dentate nucleus in the cerebellum by way of the middle cerebellar peduncle, and the vestibulo-ocular tract ascends to the nuclei of the third and fourth nerves in the pons. From the cerebellum the fibers reach the

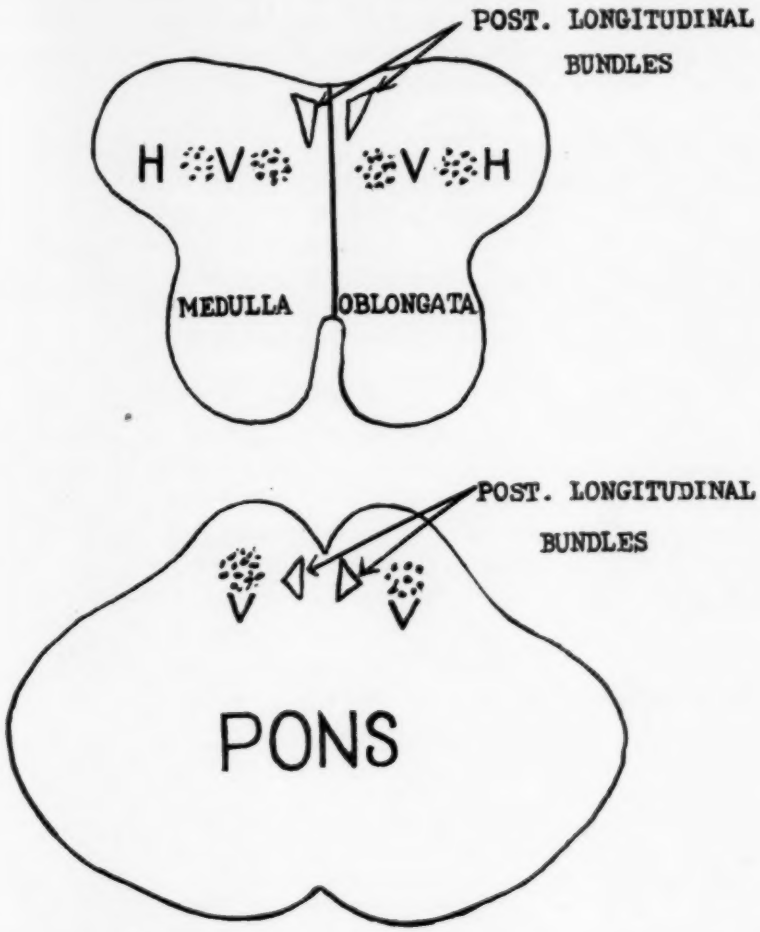

Fig. 2.—A diagram of cross-sections at different levels of the brain stem, showing the fibers of the horizontal (*H*) and vertical (*V*) canals. There are no fibers of the horizontal canal in the pons.

cortical center in the opposite temporal lobe by way of the superior cerebellar peduncle. This, in brief, is our tentative view as to the central pathway of the vestibular nerve.

A knowledge of the differential diagnosis of a peripheral and a central lesion of the eighth nerve depends on certain general principles

and is of importance in localization by means of hearing and vestibular tests.

A peripheral lesion of the labyrinth or eighth nerve is suggested by the following observations: In a case of peripheral lesion all the responses are impaired, and, conversely, the presence of any one normal response to stimulation suggests a normal labyrinth and a normal peripheral portion of the eighth nerve. Spontaneous nystagmus in the vertical plane, either upward or downward, indicates a central lesion. If stimulation produces "perverted" nystagmus, the lesion is probably central.

If the findings lead to the conclusion that the lesion is central, the next problem is to locate the lesion more definitely within the cranium. The facility with which one is able to do this depends in a great measure on how well one is able to visualize the various pathways constituting the vestibular apparatus. The simplest method of procedure is that of elimination. One begins with the labyrinth and proceeds brainward, considering each structure by itself.

CEREBELLAR LESIONS

Nystagmus.—Of twenty-two cases of cerebellar lesion nystagmus was present in fourteen and absent in five and was not noted in three. Spontaneous nystagmus most marked to the side opposite the lesion was noted in seven cases, and spontaneous nystagmus most marked to the side of the lesion was present in four. Spontaneous vertical nystagmus was noted in five cases. Spontaneous past-pointing was present in three cases and absent in thirteen and was not mentioned in six.

Hearing.—In four cases there was impairment or total loss of hearing of the nerve type on the corresponding side.

G. M. had partial impairment of hearing of the nerve type on the right side. A test of the vestibular status indicated that there was spontaneous nystagmus to the right and left, more pronounced to the left, and vertical nystagmus upward. There was no spontaneous past-pointing. Caloric tests showed the right vertical canals to be normal after five minutes. The horizontal canal on the right gave a positive reaction. There was no vertigo or past-pointing. The vertical and horizontal canals on the left gave a positive reaction. At operation a cerebellar tumor was found springing from the inferior portion of the vermis and growing to the right, which could not be removed. The otologist had made a diagnosis of cerebellar neoplasm on the right side with pressure on the eighth nerve on the right.

A. C. had total loss of hearing and of vestibular function on the right side. We considered the lesion to be a neoplasm of the angle. The neurologist diagnosed a cerebellar lesion with involvement of the pons. Operation disclosed a cerebellar cyst on the right.

M. C. had almost total loss of hearing on the right side. The vestibular test caused no response in the vertical canals on the right. The horizontal canal on the right side gave a normal response, and the canals on the left were normal. The otologist's impression of a cerebellar lesion with neighboring phenomena

affecting the eighth nerve was confirmed at operation. A neurologist did not examine this patient.

A. F. had marked impairment of hearing of the nerve type on the left side. The vestibular test showed spontaneous nystagmus in all directions, chiefly to the left. There was past-pointing with both arms outward. The caloric test did not elicit nystagmus, vertigo or past-pointing in either canal. The otologist diagnosed

TABLE 1.—*Spontaneous Nystagmus and Past-Pointing in Fourteen of Twenty-Two Cases of Cerebellar Lesions*

Patient	Direction	Direction of More Marked Nystagmus	Past-Pointing	Otologic Impression	Neurologic Diagnosis	Diagnosis at Operation or Autopsy
G. M.	R and L; vertical, up	L	None	R cerebellar lesion, interference with function of 8th nerve	R cerebellar and vermian lesion	Inferior vermis growing to the right
S. W.	R and L	L	None	Bilateral cerebellar lesion	R cerebellar lesion	R cerebellar lesion
B. G.	R and L; vertical, up and down	L	Not noted	Lesion in posterior fossa; midline cerebellar lesion	R cerebellar lesion	R cerebellar lesion
I. H.	R and L	L	None	R cerebellar lesion	L cerebellar lesion	L cerebellar lesion
M. Mc.	L and R	L	Not noted	R cerebellar lesion	R cerebellar lesion	Verified
A. F.	All directions	L	Both arms outward	R cerebellar lesion with pressure on brain stem	L cerebellar lesion	R cerebellar lesion
S. F.	To L	To L only	None	L cerebellar lesion	L cerebellar lesion	Verified
M. D.	To L	To L only	Not noted	L cerebellar lesion	L cerebellar lesion	Verified
M. C.	R and L; oblique, up and to L	R	Not noted	R cerebellar lesion with involvement of 8th nerve	R cerebellar lesion	Verified
B. K.	R and L; vertical, up and down	R	Not noted	L cerebellar lesion	L cerebellar lesion	Verified
R. O.	R and L	R	None	L cerebellar lesion	Lesion in posterior fossa; no further localization	L cerebellar lesion
I. F.	R and L; vertical	Not mentioned	None	Lesion in posterior fossa	R cerebellar (?) lesion	R cerebellar lesion
A. C.	R and L; vertical, up	Not mentioned	None	R cerebellar lesion with phenomena referable to brain stem	R cerebellar lesion with pontile involvement	Verified
C. N.	R and L; vertical, up	Not mentioned	Inward, each arm	L cerebellar lesion with phenomena referable to brain stem	L cerebellar lesion	Verified

the condition as a neoplasm of the left side of the cerebellum with pressure on the brain stem. The neurologist did not consider this condition to be a neoplasm. The findings at operation coincided with the findings of the otologist.

Caloric Tests.—The characteristic findings on caloric stimulation in a patient with a lesion of the posterior fossa with localization in the cerebellum are: (1) diminution or absence of vertigo; (2) diminution or absence of past-pointing or past-pointing in the wrong direction;

TABLE 2.—*Résumé of the Comparative Diagnoses, Otologic and Neurologic, with Operative or Postmortem Observations in Eleven of Twenty-Two Cases of Cerebellar Lesion in Which There Was Not Diagnostic Agreement on Localization*

Patient	Otologic Finding	Otologic Impression	Neurologic Impression	Diagnosis at Operation or Autopsy	Reason for Difference or Error in Diagnosis
		Disagreement: 4 Cases			
M. R.	Normal	Normal	R cerebellar neoplasm	Autopsy: glioma of R cerebellum	Age 4½ years; poor cooperation
A. C.	R and L spontaneous nystagmus, vertical up, no past-pointing Caloric test: R vertical and horizontal canals, no change from spontaneous reactions, no vertigo or past-pointing; L horizontal and vertical canals normal Hearing: total deafness on R	Complete lesion of R 8th nerve with phenomena referable to brain stem	R cerebellar lesion with involvement of pons	Operation: R gliomatous cyst in cerebellum	Vertical nystagmus upward; otologic findings justified diagnosis of total loss of function of R 8th nerve
J. L.	Normal	Normal	Neoplasm in L posterior fossa	Autopsy: Encephalomalacia due to hemorrhage in cerebellum; no neoplasm	Error cannot be explained; fairly good cooperation on part of patient; normal findings on two examinations
A. F.	Partial impairment of hearing of nerve type; spontaneous nystagmus in all directions, more marked to L; past-pointing with both arms outward Caloric test: no reactions, nystagmus, vertigo or past-pointing in either canal	R cerebellar lesion with pressure on brain stem, or multiple sclerosis	Neoplasm; not diagnosed	R cerebellar neoplasm	Otologic findings at operation coincided as to side (R)
		Partial Agreement: 2 Cases			
R. O.	R and L fine, spontaneous nystagmus, more marked to R; no spontaneous past-pointing Caloric test: R canals, normal nystagmus, past-pointing, vertigo; L canals, normal nystagmus, no past-pointing or vertigo Normal hearing	Lesion of L cerebellar hemisphere	Tumor in posterior fossa; no further localization	Operation: glioma in L cerebellar hemisphere	Verified
I. F	Normal hearing; spontaneous nystagmus to R and L; vertical, up; no spontaneous past-pointing Caloric test: R and L canals, prompt nystagmus; past-pointing could not be tested; no vertigo	Marked diminution of vertigo, suggesting considerable intracranial pressure in posterior fossa	Neoplasm in posterior fossa; R cerebellar neoplasm ?	R cerebellar neoplasm	Impossible to test past-pointing; partial localization

		Incomplete Examination: 2 Cases			
B. G.	Hearing was present but could not be tested; vertical canals could not be tested	Peripheral portion of 8th nerve not involved; lesion located near midline (posterior fossa)	R cerebellar neoplasm	Operation: R cerebellar neoplasm	Poor cooperation; vertical canals could not be tested
A. S.	Hearing normal on R, partially defective on L suggesting involvement of nerve type Caloric test: total loss of caloric response with patient lying down	Increased intracranial pressure; lesion could not be localized because of restricted examination	R cerebellar neoplasm	Operation: large extracerebellar neoplasm	Incomplete examination
		Difference as to Side of Localization: 2 Cases			
I. H.	Normal hearing; vertical nystagmus, R, L and up; no spontaneous past-pointing Caloric test: R horizontal and vertical canals, no past-pointing with R arm; normal with L arm; L horizontal and vertical canals, normal past-pointing, very little vertigo	R cerebellar neoplasm with neighboring phenomena influencing brain stem	L cerebellar neoplasm	Operation: L cerebellar neoplasm	R horizontal and vertical canals; no past-pointing with R arm, normal with L
H. G.	Normal hearing; spontaneous horizontal nystagmus, R, L, vertical and obliquely upward Caloric test: no past-pointing with R arm, irregular with L arm (inward or outward); vertical canals, abnormal past-pointing (spontaneous and induced) with abnormal nystagmus	Bilateral lesion of posterior fossa: cerebellar lesion with involvement of brain stem	L cerebellar neoplasm	Operation: L cerebellar neoplasm	Bilateral changes in past-pointing on stimulation of either set of canals
		Otologic Findings Verified—Not Examined by Neurologist: 1 Case			
M. C.	Hearing: almost totally absent on R, normal on left Spontaneous nystagmus: coarse to L; finer to R; oblique, upward and to L Caloric test: R vertical canals, no responses as to nystagmus or past-pointing; R horizontal canal, normal responses as to nystagmus and past-pointing; no vertigo; L canals normal	R cerebellar lesion with neighboring phenomena affecting function of 8th nerve	Not examined by neurologist	Operation: R cerebellar neoplasm	Verified

(3) normal nystagmus unless pressure on the brain stem causes deviations from the normal, such as spontaneous vertical or oblique nystagmus or perverted nystagmus on stimulation, and (4) normal hearing. Occasionally, owing to pressure on the eighth nerve of a cerebellar neoplasm, there may be present impairment of hearing of the nerve type. Spontaneous past-pointing in one direction or, in the absence of spontaneous past-pointing, an inability to produce reactive past-pointing is suggestive of a lesion in the cerebellum. On the other hand, when normal past-pointing of each arm in either direction can be produced, it is probable that the cerebellum is intact. As in all methods of diagnosis, there are exceptions to this rule, but in general the foregoing observation holds true.

EXTRACEREBELLAR LESIONS OF THE PONTILE ANGLE AND PONS

There were eighteen cases in this group, including one of neoplasm in the pons. There were an equal number of men and women. Their ages varied between 23 and 71 years. The duration of illness before admission varied between eight months and fifteen years.

The most common symptom in this group was loss of hearing; this occurred in sixteen of the seventeen patients with tumor in the angle, and in fourteen of these it was the earliest complaint; in two others loss of hearing was preceded by tinnitus. In two, headache was the first symptom noted. In addition to deafness, nine patients had a complaint of vertigo, headache and dimness of vision; three had attacks of transient blindness. Eleven patients had a complaint of disturbance of gait, weakness or clumsiness, and two, of disturbance in speech and difficulty in swallowing.

When the growth is fully developed, the diagnosis of a neoplasm in the angle, from the vestibular cochlear findings, presents little difficulty. In the earlier stages, the presence of tinnitus and partial impairment of hearing of the nerve type with vertigo not uncommonly lead to a diagnosis of Ménière's disease. With further changes in the cochlear nerve and especially with diminution, and later loss, of vestibular function, the diagnosis becomes apparent.

Since a large percentage of all tumors of the brain are tumors of the cerebellopontile angle, a method that is so helpful in either localizing them or excluding them from this region immediately becomes of utmost importance. While it is true that the neurologist can diagnose lesions of the angle without a vestibular examination, it is equally true that general clinical phenomena must appear before such a diagnosis can be made. Gordon [6] cited instances of an unusual paucity of symp-

6. Gordon, Alfred: Unusual Paucity of Symptoms of Cases of Pontocerebellar Tumors, Arch. Int. Med. **30**:606 (Nov.) 1922.

toms and signs in cases of tumor of the pontile angle. On the other hand, with a vestibular examination a diagnosis can be made rather early, at a time when surgical intervention promises the best results. The number of conditions that could simulate a typical vestibular symptom complex of the cerebellopontile angle are few, so that the vestibular tests furnish a definite means of determining the presence or absence of such a lesion. The following phenomena are usually regarded as characteristic in cases of tumor of the angle: (1) on the side of the tumor, loss or impairment of auditory and vestibular function, and (2) on the opposite side, normal auditory function and normal responses from the horizontal canal but absence of responses for the vertical canals.

In brief, otologic examination reveals a loss of function on both sides except in the cochlea and horizontal canal of the ear on the side opposite the tumor. In none of the five cases in which changes were noted on stimulation of the opposite canals was this change observed. On other occasions we have been able to demonstrate this finding. When such a combination of both peripheral and central phenomena exists in the same patient, the lesion is naturally located in the cerebellopontile angle. A tumor in this situation destroys the eighth nerve and produces a typical picture of a peripheral lesion on that side and, in addition, pressure phenomena which manifest themselves by various signs of a central lesion on a test of the opposite canals.

The presence of a peripheral lesion in this symptom complex is not difficult to determine, as the patient usually has a total loss of function of the eighth nerve in both branches, or, if the hearing is partially retained, the responses from the horizontal and vertical canals on that side are completely absent, making the evidence of a peripheral lesion on that side fairly clear. It is the element of a central lesion that requires the greatest interpretive skill. None of our patients showed typical reactions on stimulation of the opposite canals. There may be variations, as in five of our cases, from this characteristic reaction, making the interpretation far more difficult. For instance, the patient's hearing on the unaffected side may not be normal, owing to a long-standing catarrhal or suppurative process or perhaps to an old preexisting degeneration of the eighth nerve or cochlear nerve. Again, the horizontal canal on that side may respond but in such a manner as to make it difficult to determine that the response is perhaps not impaired as compared to that of the fully normal canal. In cases of this type other phenomena are often exhibited which are indicative of a central lesion, such as vertical nystagmus, up or down or perverted nystagmus on the unaffected side or a definite disproportion between ocular responses and vertigo. In one of our cases perverted nystagmus was present on

TABLE 3.—*Spontaneous Nystagmus and Past-Pointing in Cases of Tumor of the Pontile Angle*

Patient	Direction	More Marked Direction	Past-Pointing	Otologic Impression, Involvement of	Neurologic Diagnosis	Operation or Autopsy
R. K.	R and L; vertical, up	Not mentioned	None	Peripheral portion of L 8th nerve	Neoplasm; L pontile angle	Operation
J. M.	R and L; vertical, up	Not mentioned	None	Peripheral portion of L 8th nerve	Neoplasm; L pontile angle	Operation
J. F.	R and L	Not mentioned	None	Peripheral portion of R 8th nerve	Neoplasm; R pontile angle	Operation and autopsy
J. S.	R and L	Not mentioned	None	Peripheral portion of L 8th nerve	Neoplasm; L pontile angle	Operation
S. B.	R and L	Not mentioned	None	Peripheral portion of R 8th nerve	Neoplasm; R pontile angle	Operation
A. S.	R and L; vertical, up	Not mentioned	Not mentioned	Peripheral portion of 8th nerve; bilateral; marked	Neoplasm; pontile angle; bilateral	Operation
E. R.	None	.....	None	Peripheral portion of L 8th nerve; very little function	Neoplasm; L pontile angle	Autopsy
F. S.	R and L; vertical, up	L	With both arms to L	Peripheral portion of R 8th nerve	Neoplasm; R pontile angle	Operation
A. Y.	R and L; vertical, up	Not mentioned	With both arms to L	Peripheral portion of 8th nerve; total; bilateral	Neoplasm; pontile angle; bilateral	Operation
L. S.	R	.....	None	Peripheral portion of R 8th nerve	Pontile neoplasm	Operation and autopsy
M. S.	R and L	Not mentioned	None	Peripheral portion of L 8th nerve	Neoplasm; L pontile angle	Operation
J. K.	R and L	R	Inward with L arm	Peripheral portion of R 8th nerve	Neoplasm; R pontile angle	Operation
J. D.	R and L	R	Spontaneous; direction not mentioned	Peripheral portion of R 8th nerve	Neoplasm; R pontile angle	Operation
A. N.	None	.....	None	Peripheral portion of R 8th nerve	Neoplasm; R pontile angle	Operation
M. R.	R and L	L	None	Peripheral portion of L 8th nerve	Neoplasm; L pontile angle	Operation
F. K.	R and L	L	To L with both arms; in prone position only	Peripheral portion of L 8th nerve	Neoplasm; L pontile angle	Operation
H. C.	R and L; vertical and oblique, up	R	None	Peripheral portion of L 8th nerve	Neoplasm; L pontile angle	Operation
L. Sc.	R and L	Not mentioned	Not mentioned	Peripheral portion of R 8th nerve	Neoplasm; R pontile angle	Operation and autopsy

stimulation of the opposite horizontal canal, i. e., vertical nystagmus upward and downward following such stimulation. In three cases there was interference or wrong past-pointing with either hand on stimulation of the opposite canals. In twelve of the cases of tumor in the angle there was a normal response on stimulation of the opposite vertical canals. Careful observation in such instances makes it possible sometimes to detect a definite difference between the activity of the horizontal and that of the vertical canals.

TABLE 4.—*Induced Reactions: Nystagmus and Past-Pointing in Cases of Tumor of the Pontile Angle*

Patients	Left Canals	Right Canals
R. K.*	No response	Positive reactions: no past-pointing with L arm
J. M.	No response	Normal
J. F.	Normal	No response
J. S.*	No response	Vertical canals normal; no vertigo; horizontal canal perverted, nystagmus oblique, upward and to L; very little vertigo
S. B.	Normal	Very weak, delayed responses
A. S.	Bilateral total loss of hearing; very little or no response R and L; inward past-pointing on stimulation of each set of canals	
E. R.	Faint response for nystagmus; no past-pointing or vertigo	Normal
F. S.	Normal	No response
A. Y.	Normal nystagmus; inward past-pointing with each arm	No response; inward past-pointing with each arm
L. S.	Normal	No response
M. S.	No response	Normal
J. K.*	Spontaneous past-pointing inward; L arm not influenced	No response; hearing of R showed partial defect of nerve
J. D.	Normal	No response
A. N.	Normal	No response
M. R.*	No response	Normal nystagmus and vertigo; past-pointing with L arm but not with R
F. K.	No response	Normal
H. C.	No response	Normal
L. Sc.	Normal	No response

* An abnormal condition was noted in the canals opposite to the site of the lesion.

The isolated loss or marked diminution of responses from the vertical canals on the opposite side, the occurrence of perverted nystagmus on stimulation of the opposite horizontal canal and abnormalities of past-pointing appear to be caused by pressure of a tumor on the pons. In a case of a well advanced growth in the angle, abnormalities in past-pointing are frequently observed either in the form of spontaneous past-pointing or as absence or impairment of past-pointing after stimulation of the ear. Crossed past-pointing, in which both arms past-point

inward or outward, was not observed in our cases but has been noted on other occasions.

Nystagmus.—The incidence of spontaneous nystagmus in the cases of tumor of the pons and pontile angle was as follows:

	Number of Cases	Direction of Nystagmus	Number of Cases
Lesion on R	7	Not mentioned	3
		More marked to R	2
		More marked to L	1
		No nystagmus	1
Lesion on L	8	Not mentioned	4
		More marked to L	2
		More marked to R	1
		No nystagmus	1
Bilateral lesion	2	Not mentioned	2
Pontile lesion	1	To R only	1

Of the fifteen cases of tumor of the pontile angle localized to the right or the left, nystagmus was directed to the side of the lesion in four and to the opposite side in two, and the direction was not mentioned in seven. There was no nystagmus in two. Spontaneous vertical nystagmus was present in six cases.

Spontaneous Past-Pointing.—This was not present in eleven cases and was not mentioned in two. In the five cases in which it was noted the distribution was as follows:

Lesion on R	(3 cases)	1 case: both arms to L 1 case: L arm inward 1 case: direction not noted
Lesion on L	(2 cases)	1 case: both arms to L (prone position) 1 case: past-pointing, direction not noted
Bilateral lesion	(1 case)	Both arms to L

In the five cases in which spontaneous past-pointing was present, localization was not helped by this finding.

Hearing.—There was total loss of hearing in sixteen cases: in nine on the left side, and in seven on the right. Hearing was present in two cases: In one there was marked impairment of hearing, although vestibular function was present, and in the other the hearing was moderately impaired, with total loss of vestibular function. The neoplasm was found on the side corresponding to the loss of hearing.

Caloric Tests.—Changes in opposite canals on stimulation occurred as follows in four cases of tumor in the angle:

Patient	Side of Lesion	Observations
J. K.	R	Spontaneous past-pointing inward with L arm not influenced by stimulation of L canal
R. K.	L	Positive reaction: R arm past-pointed to R; no past-pointing with L arm
J. S.	L	Normal vertical canals; no vertigo; horizontal canal showed perverted nystagmus oblique, upward and to L; very little vertigo
M. R.	L	Past-pointing with L arm but not with R

COMMENT

Keschner and Grossman [7] made a comprehensive report on cerebellar symptomatology, with an evaluation on the basis of intracerebellar and extracerebellar lesions. From a study of table 5 it is evident that the disturbance in synergic movement occurred more constantly in the cases of cerebellar lesion. The degree of involvement was also greater, as indicated by an analysis of the signs of cerebellar involvement. These were usually more marked on the side of the lesion. They may there-

TABLE 5.—*Neurologic Signs and Symptoms in Twenty-Two Cases of Cerebellar Lesions and Eighteen Cases of Tumor of the Pontile Angle*

Symptoms			Number of Cases	
			Cerebellar (22)	Pontile Angle (18)
Direct	Asynergia	Gait	21	9
		Station	16	10
		Attitude of head	13	10
		Ataxia of arm	21	9
		Ataxia of leg	21	4
		Adiadokokinesis	16	9
		Gordon Holmes sign	6	2
		Hypotonia	5	4
	Vestibular	Spontaneous nystagmus	14	16
		Spontaneous past-pointing	3	5
Indirect	Cranial nerves	1	..	..
		2	19	14
		3, 4, 6	7	7
		5, sensory and motor	3	7
		5, sensory	5	2
		Corneal sensibility	7	4
		Peripheral facial	5	4
		8	4	17
		9, 10, 11, 12	4	4
		Signs referable to pyramidal tract	16	11
Subjective		Headache	21	13
		Vomiting	19	3
		Vertigo	17	12
		Diplopia	7	1
		Clumsiness of gait	6	9
		Diminished vision	4	9
		Deafness	4	16 (2 partial)
		Tinnitus	3	6
		Paresthesia of face	3	5
		Disturbance of sphincters	1	1
		Mental disturbances	5	4

fore be used as a factor in distinguishing lesions within the cerebellum as well as in localizing the side on which the lesion exists. In the cases of cerebellopontile involvement the signs of asynergia were less marked and occurred in a proportionally fewer number of cases; nevertheless, they indicated the side on which the lesion existed. The almost constant involvement of the eighth nerve on the side of the lesion is a more reliable guide to localization in the cases of cerebellopontile involvement. As a rule, the general symptoms of tumor of the brain appear earlier

7. Keschner, Moses, and Grossman, Morris: Cerebellar Symptomatology Evaluation on the Basis of Intracerebellar and Extracerebellar Lesions, Arch. Neurol. & Psychiat. **19**:78 (Jan.) 1928.

TABLE 6.—*Observations on Twenty-Two Verified Cases of Cerebellar Lesion*

Patient	Auditory Status	Hearing	Vestibular Status: Spontaneous Nystagmus	Vestibular Status: Past-Pointing	Vestibular Status: Induced Nystagmus: Caloric Tests	Otologic Impression	Neurologic Impression	Operation or Autopsy	Verification and Reason for Difference or Error in Diagnosis
N. R.	Normal	Normal	None	None	R vertical canals: faint nystagmus in 2 min.; normal past-pointing R horizontal canal: marked nystagmus, vertigo marked; R arm, no past-pointing L vertical canals: positive in 1 min.; past-pointing with L arm, R arm touched L horizontal canal: no nystagmus or vertigo; past-pointing with L arm, R arm touched	Interference with all past-pointing with R arm except that following stimulation of R vertical canals, suggesting extensive lesion in R lateral lobe of cerebellum	R cerebellar neoplasm	Operation: R cerebellar cyst	Verified
M. R.	Normal	Normal	None	None	R canals: positive L canals: positive	Normal	R cerebellar neoplasm	Autopsy: R cerebellar glioma	Age 4½ years; poor cooperation
I. F.	Normal	Normal	R and L; vertical, up; no vertigo	None	R: prompt nystagmus; impossible to test past-pointing; very little vertigo L: prompt nystagmus	Marked diminution of vertigo, suggesting considerable intracranial pressure in posterior fossa	Neoplasm in posterior fossa; R cerebellar neoplasm?	R cerebellar neoplasm	Impossible to test past-pointing; partial localization
G. M.	Normal	Partial involvement of nerve on R	R and L, more marked to L; vertical, up	None	R vertical canals: negative after 5 min. R horizontal canal: positive; no vertigo or past-pointing L vertical and horizontal canals: positive	Increased intracranial pressure on R side (cerebellum) with interference of R 8th nerve	Neoplasm of vermis and right cerebellar lobe	Cerebellar tumor from inferior vermis growing to R; could not be removed	Verified
A. C.	Normal	Total deafness on R	R and L; vertical, up	None	R vertical and horizontal canals: no change from spontaneous reactions; no vertigo or past-pointing L vertical and horizontal canals: normal	Complete lesion of R 8th nerve with phenomena referable to brain stem	R cerebellar neoplasm with involvement of pons	Operation: R gliomatous cyst in cerebellum	Vertical nystagmus, up; otologic findings justified diagnosis of total loss of function of R 8th nerve
B. K.	Normal	Normal	R and L, slow to L; vertical, down and up	.....	L vertical canals: negative after 4 min.; no nystagmus, past-pointing or vertigo L horizontal canal: nystagmus to R; spontaneous nystagmus persisting in all directions R vertical canals: faint nystagmus; no vertigo R horizontal canals: nystagmus to R, with pallor and sweating; slight past-pointing with R arm to R	(1) Marked diminution of vertigo with absence of or diminution of past-pointing; entire cerebellum, chiefly L side involved; (2) lesion affecting posterior longitudinal bundle with perhaps more involvement on L side	L cerebellar neoplasm	L cerebellar neoplasm	Verified

S. F.	Normal	Normal	L	None	L vertical canals: faint nystagmus; no past-pointing L horizontal canal: normal nystagmus; no past-pointing R vertical canals: faint nystagmus; no past-pointing R horizontal canal: normal nystagmus	Absence of past-pointing on caloric stimulation of R and L vertical canals and L horizontal canal, indicating increased intracranial pressure, and L cerebellar lesion	L cerebellar neoplasm	Operation: L cerebellar neoplasm	Verified
S. W.	Normal	Normal	R and L, more marked to L	None	R canals: normal nystagmus; no vertigo or past-pointing L canals: normal nystagmus; no vertigo or past-pointing	Extensive bilateral disease of cerebellum with marked increase in intracranial pressure	Bilateral cerebellar neoplasm	Operation: bilateral disease of cerebellum	Verified
B. G.	Normal	Present; poor cooperation	R and L, more marked to L; vertical, up and down	None; poor condition, patient could not sit up	L horizontal canal: prompt response, definite vertigo, but past-pointing irregular R: normal response, nystagmus, past-pointing and vertigo	Eighth nerve not involved peripherally; lesion located near midline (posterior fossa); vertical canals could not be tested	R cerebellar neoplasm	Operation: R cerebellar neoplasm	Poor cooperation; vertical canals could not be tested
R. O.	Normal	Normal	R and L, more marked to R; fine	None	R canals: normal nystagmus, past-pointing and vertigo L canals: normal nystagmus; no past-pointing or vertigo	Lesion of L cerebellar hemisphere	Tumor in posterior fossa; no further localization	Operation: glioma in L cerebellar hemisphere	Verified
J. L.	Normal	Normal	None	None; fair cooperation	R and L horizontal and vertical canals: normal nystagmus and past-pointing	Normal	Neoplasm in posterior fossa	Autopsy: encephalomalacia due to hemorrhage in cerebellum; no neoplasm	Error cannot be explained; fairly good cooperation of patient
I. H.	Normal	Normal	R and L, more rapid to L; vertical, up; coarse	None; dysmetria of of R hand	R and L horizontal canals: normal nystagmus, little vertigo Vertical canals: no vertigo, nausea or vomiting R horizontal and vertical canals: no past-pointing with R hand, normal with L hand L horizontal and vertical canals: normal past-pointing	R cerebellar neoplasm with neighboring phenomena influencing function of brain stem	L cerebellar neoplasm	Operation: L cerebellar neoplasm	No past-pointing with R hand in caloric test of R horizontal and vertical canals
M. C.	Normal	Normal on L; almost totally absent on R	Coarse to L; finer to R; oblique, up; to L	.....	R vertical canals: no nystagmus, vertigo or past-pointing R horizontal canals: normal responses as to nystagmus and past-pointing; no vertigo L canals: normal	R cerebellar lesion with neighboring phenomena affecting function of 8th nerve	Not examined by neurologist	Operation: R cerebellar neoplasm	Otologic findings verified at operation

TABLE 6.—*Observations on Twenty-Two Verified Cases of Cerebellar Lesion—Continued*

Patient	Auditory Status	Hearing	Vestibular Status: Spontaneous Nystagmus	Vestibular Status: Past-Pointing	Vestibular Status: Induced Nystagmus: Caloric Tests	Otologic Impression	Neurologic Impression	Operation or Autopsy	Verification and Reason for Difference or Error in Diagnosis
C. N.	Normal	Normal but persistently lateralized to L; no other signs of defect in hearing	R and L; vertical, up	Inward, both hands	R horizontal and vertical canals: normal nystagmus and past-pointing L horizontal and vertical canals: normal responses as to nystagmus; no change in spontaneous past-pointing, i.e., inward past-pointing unaffected; no vertigo, nausea or vomiting	Absence of past-pointing on stimulation of horizontal and vertical canals (nystagmus normal), indicating interference with cerebellocerebral pathway; lesion probably in L cerebellar hemisphere; vertical nystagmus pointing to pressure on brain stem	Neoplasm in vermis and L cerebellum	Autopsy: L cerebellar neoplasm	Verified
J. A.	Normal	Normal	.....	.....	L vertical and horizontal canals: nystagmus and vertigo but no past-pointing R canals: normal responses	Lesion of L posterior fossa (horn)	L cerebellar lesion involving brain stem	Autopsy: lesion in L cerebellum, vermis and brain stem	Verified
R. K.	Normal	Normal	None	None	L vertical canals: delayed nystagmus; past-pointing normal; no vertigo or vomiting R vertical and horizontal canals: no past-pointing with L hand	R cerebellar lesion	Cerebellar neoplasm?	Autopsy: bilateral tuberculoma of cerebellum (R side more markedly involved than L)	Verified
E. C.	Normal	Unsatisfactory test; apparently no lesion of cochlea	None	Inward with L hand	L horizontal and vertical canals: prompt nystagmus; normal past-pointing on stimulation of L vertical canals; no past-pointing with L hand on stimulation of L horizontal canal R vertical canals: no vertigo or nystagmus R horizontal canal: no nystagmus Past-pointing not influenced by stimulation of R vertical and horizontal canals, i.e., patient touched with R hand; spontaneous past-pointing with L hand not influenced	(1) Normal cochlear function (2) No function of vertical canals (3) Spontaneous past-pointing inward with L hand (4) No reaction for past-pointing in canals on R side Impression: spontaneous past-pointing and absence of induced past-pointing on R suggesting R cerebellar neoplasm	R cerebellar neoplasm	Operation: R cerebellar neoplasm	Verified

A. S.	Normal	Partial involvement of L nerve; normal on R	.....	.....	Total loss of reaction; patient lying down	Incomplete examination; findings indicate increased intracranial pressure; lesion not localized because of restricted examination	R cerebellar neoplasm	Operation: large extracerebellar neoplasm	Incomplete examination
M. Mc.	Normal	Normal	R and L, more marked to L; no vertical	.....	R horizontal and vertical canals: normal response for nystagmus; vertigo diminished; past-pointing perverted so that both arms past-pointed to R instead of to L; no lesion in either eighth nerve	No lesion in 8th nerve or brain stem; test indicates lesion in R lateral lobe of cerebellum	R cerebellar neoplasm	Operation: cystic glioma in R cerebellar lobe; aspirated	Verified
A. F.	Normal	Weber to L; B.C. shortened L; high tones markedly reduced; noise app. R ear; apparently hears L; normal hearing R	R and L, more marked to L; vertical, up and down	Outward, both arms	No reactions, nystagmus, vertigo or past-pointing in any canal	Findings indicate neoplasm in L cerebellar lobe with pressure on brain stem	Neoplasm (not localized)	R cerebellar neoplasm	Otologic and operative findings coincided as to side (R)
M. D.	Normal	Normal	L, more marked with patient prone	.....	R canals: normal nystagmus and past-pointing L canals: no vertigo; no past-pointing with L hand and proper past-pointing with R hand (same for L horizontal canal); normal nystagmus both sets of canals	Interference with vertigo on L indicating L cerebellar lesion	L cerebellar neoplasm; L cerebellar cyst	L cerebellar cyst	Verified
H. G.	Normal	Normal	.....	.....	R and L horizontal and vertical canals: prompt nystagmus, somewhat oblique on stimulation of horizontal canal R horizontal and vertical canals: no past-pointing L horizontal and vertical canals: abnormal past-pointing, i.e., occasional inward past-pointing with L hand	Spontaneous horizontal nystagmus R and L and vertical and oblique upward; no past-pointing with R hand, L hand irregular (inward or outward); abnormal past-pointing (spontaneous and induced) with abnormal nystagmus (vertical) pointing to bilateral lesion in posterior fossa: cerebellar lesion with involvement of brain stem	L cerebellar neoplasm	Operation: L cerebellar cyst	Error caused by bilateral changes in past-pointing on stimulation of either set of canals

and are more pronounced in the cases of cerebellar involvement. The cranial nerves are less impaired. The early onset and greater intensity of the cerebellar symptoms, especially of disturbance in gait and ataxia, are in favor of a diagnosis of intracerebellar lesion. The presence of signs of cerebellar involvement on one side, with involvement of the pyramidal tracts on the opposite side, is more in favor of a diagnosis of a lesion outside the cerebellum compressing the pons. Tinnitus and deafness, associated with involvement of the trigeminal and of the facial nerve on the same side, are early and almost constant symptoms in cases of lesion in the cerebellopontile angle.

CONCLUSIONS

1. Caloric tests are of definite value in the localization of a lesion of the posterior fossa.

2. The differential diagnosis of an infratentorial from a supratentorial lesion can frequently be made.

3. Cerebellar neoplasms which have invaded the surface of the cerebellum, because of pressure phenomena affecting the eighth nerve, may give signs of a neoplasm of the angle on otologic examination.

4. Caloric tests are of distinct value in the early diagnosis of a lesion of the cerebellopontile angle.

5. The so-called characteristic finding in a case of neoplasm of the angle, namely, loss of reaction on testing of the opposite vertical canals, is frequently lacking. Other evidence of indirect pressure phenomena may be present on vestibular examination.

6. A comparative diagnostic study by means of otologic, neurologic, surgical and postmortem observations on forty cases of lesions of the posterior fossa has been made.

1070 Park Avenue
66 West Eighty-Seventh Street

ABSTRACT OF DISCUSSION

Dr. Isidore Friesner, New York: Some work which has developed this past year at the Neurological Institute of New York is remarkable. I believe that otologists have been rather slow in making observations on the eighth nerve. The work of the ophthalmologists antedates that of the otologists by many years. Recent neurologic work deals with the sense of smell. These tests, which are fine and accurate, show amazing results. There are two elements in the sense of smell: the trifacial element and the olfactory element. Patients from the general neurologic service were sent for these olfactory tests. The persons making the tests were not informed of the diagnosis in any case. I am told that it was possible to determine the side on which there was a disturbance of the trifacial element and whether there was a tumor of the posterior fossa or one of the angle and also the side on which the tumor was located. That had been done repeatedly and correctly. There is no question in my mind that the subject should be pursued in all hospitals where there is a neurologic service. Otologists should continue to carry out functional tests of the eighth nerve in all neurologic conditions.

VALUE OF SPEECH TRAINING IN CASES OF CLEFT PALATE AND OTHER ORAL CONDITIONS

ERNEST E. SCHARFE, M.D.
MONTREAL, CANADA

The quality of the patient's speech is the best criterion of the success of treatment of cleft palate. To obtain perfect speech in the majority of cases one has to correct not only the escape of air nasally but also defects of articulation. The soft palate is part of a muscular mechanism the function of which is to separate the oral cavity from the nasopharyngeal cavity during swallowing and during speech. This closure must be complete for correct articulation of every sound in the English language except the three nasal consonants M, N and NG. For the articulation of these consonants the air escapes through the nose, and the resonance is essentially nasal. It is apparent, therefore, that the palatopharyngeal sphincter not only must be capable of perfect closure but must also be capable of very rapid movement.

REQUIREMENTS FOR SUCCESS IN TREATMENT OF CLEFT PALATE

The following requirements are necessary for successful results in the treatment of cleft palate: 1. There must be competent palatopharyngeal sphincter. This may be accomplished by (*a*) operation, the use of an artificial appliance or a combination of the two and by (*b*) exercises to improve the action of the palatopharyngeal sphincter. In other words, the patient not only must be given a good palate but must be taught to use it. Wardill aptly said: "The first essential is to make the child valve-conscious." The child must first be taught that the air must pass through the mouth during speech. This is best accomplished by simple exercises, such as blowing out the cheeks, blowing through the mouth as if blowing out a candle, blowing bubbles, etc. Toy balloons are popular with children and can be used to advantage. For older children whistling is a very good exercise. Palatal movement can often be improved by touching the soft palate with a tongue depressor while the patient phonates AH. Electrical stimulation of the muscles of the palate can be used on older children, but it is rather difficult to use and frightens the younger patients. My associates and I have not found it very useful. The simplest and best method is to have the patient watch his own palate in a mirror. The mirror should be sufficiently large

From the Clinic for Speech Training, Children's Memorial Hospital.
Read before the Section on Laryngology, Otology and Rhinology at the Eighty-Sixth Annual Session of the American Medical Association, Atlantic City, N. J., June 14, 1935.

so that he can also watch the movements of the instructor's palate. In this way he can visualize what is required, and the element of competition is also useful. Breathing exercises and tongue exercises should also be started at this stage to prepare the child for future training in articulation.

2. The degree of intelligence is a very important factor in the development of speech in any child. Judging from the study of the intelligence quotients of our patients, mental deficiency of varying degree is fairly common in patients with cleft palate. It is also noticeable that defects of articulation are more frequent and also more difficult to correct in the patient with a low intelligence quotient.

3. Ambition, discipline and cooperation are important factors in obtaining successful results.

4. The acuity of hearing also has a bearing on the problem. To learn to speak properly the child must be able to hear the sounds correctly. The presence of a cleft palate makes a patient more susceptible to catarrh of the eustachian tube and suppurative otitis media, with resultant defects in hearing, at an age at which acuity of hearing is most important.

5. Special training is necessary. This involves the previously mentioned exercises and also the correction of defects of articulation. Intelligent cooperation of parents and teachers is an absolute essential. Speech training in a clinic once or twice weekly is almost useless unless a similar amount of time is spent each day at home, and considerable of the time in the clinic is spent in instructing the parents how to train the child at home.

CLEFT PALATE SPEECH

Patients with cleft palate may be divided into five main groups according to the characteristics of their speech:

Group 1: Escape of air nasally and failure to articulate consonants (except M N and NG)

Group 2: Escape of air nasally and defects of articulation
- (*a*) Omission of some consonants
- (*b*) Incorrect articulation of some consonants
- (*c*) Substitutions (T and D for K and G; W for R, etc.)
- (*d*) Compensatory speech habits
  - Glottal stop
  - Pharyngeal and nasal S
  - Constriction of nares, etc.

Group 3: Only escape of air through nose

Group 4: Defects of articulation only (no escape of air nasally)
- (*a*) Omission of some consonants
- (*b*) Incorrect articulation of some consonants
- (*c*) Substitutions (T and D for K and G; W for R, etc.)
- (*d*) Compensatory speech habits

Group 5: Normal speech

The defect presented by the patients in group 1 is, of course, the worst. There is an escape of air through the nose when the patient makes all sounds, and he makes no attempt to articulate any except the nasal consonants. His speech is not understandable, except possibly to his parents. The intelligence quotient of such a patient is low, and hearing may also be impaired. One should not consider these children as hopeless, however, as we have two patients with speech defects of this type who acquired understandable speech in two years. The prognosis depends largely on the degree of intelligence, the cooperation of the child and the parent and the acuity of hearing.

The patients in group 2 make up probably the largest group in the average clinic. There are escape of air nasally when some or all of the sounds are made and various types of defects of articulation. The intelligence of the patients is much superior to that of the patients in group 1; in fact, many of the children are very bright. The defects of articulation are of four main types: (*a*) omission of some consonants, (*b*) incorrect articulation of some consonants, (*c*) substitutions and (*d*) compensatory speech habits. The first three types are not necessarily typical of cleft palate speech. They are the types of defects of articulation which may be found in any child and are rather a persistence of baby talk. However, most patients with cleft palate show these defects to some extent. If the patient is intelligent and cooperative, the defect is usually quite easy to correct.

In the fourth type of compensatory speech habits there are the typical defects of articulation which arise from a cleft palate. The child is usually moderately intelligent and endeavors by various means to overcome the difficulties in speech caused by the cleft palate. He first attempts to articulate the plosive consonants, P, B, T, D, K and G, and finds that the air escapes through the nose, spoiling the plosive effect. He also finds that the only place he can get a complete closure is in the glottis, and this is the beginning of one of the most common compensatory speech habits in cases of cleft palate, namely, the glottal stop. This is made by bringing together the vocal cords, momentarily stopping the breath stream at this point, and then suddenly releasing it. This is nothing more than the ordinary grunt, and a fair imitation of the plosive consonants may be obtained in this way. The speech, however, is very unpleasant to listen to. The glottal stop may be substituted for any of the plosives, but it is most commonly used as a substitute for K and G. For P, B, T and D the child can usually learn the positions of the tongue and lip by imitation, and the glottal stop is not developed so often as a substitute for these consonants. The S sound is one of the most difficult for the patient with a cleft palate to acquire. In the first place, prolonged friction is necessary, and this is impossible without a closed palatopharyngeal sphincter. Secondly, it is very difficult to learn

the position of the tongue for this sound by imitation. The patients react to this in various ways. Those who are not very intelligent or are rather indifferent are quite satisfied simply to let the air escape through the nose and with or without the aid of "constriction of the nares" get a fricative sound. Of course, to the untrained ear of a very young child whose hearing is not well developed or who has some other auditory impairment there is possibly very little difference between the friction in the articulation of a correct S sound and the rush of air through the nose that constitutes a nasal S. Other patients, either owing to a higher grade of intelligence or owing to the fact that their hearing is more acute, are not satisfied with a nasal S and develop a pharyngeal S. I do not know exactly how they execute this, but the chief characteristic of it is that it can be made with the mouth open. The tongue is most probably drawn back close to the posterior pharyngeal wall, and the S sound is produced by a rush of air through this space. It is a much better sound than the nasal S but equally hard to correct. A few of the more intelligent patients learn the correct position of the tongue, and their S is a combination of a weak normal one supplemented by the escape of air nasally. Constriction of the nares is one of the first habits that these patients acquire and is an attempt to limit the escape of air through the nose. In this way they get a better plosive effect, but they also make the escape of air through the nose more audible.

These compensatory speech habits constitute the most difficult problems in speech training, as the old habits must be forgotten before new ones can be formed.

The defect shown by the patients in group 3 constitutes, as a rule, one of the stages in speech training, and the escape of air nasally still has to be corrected either by further training or by further operative work.

The patients in group 4 present defects similar to those of group 2, except that escape of air through the nose has been eliminated.

Normal speech (group 5) is the ultimate goal that all hope for but too rarely observe in treatment of cleft palate.

CORRECTION OF DEFECTS OF ARTICULATION

If the child has already begun to talk, the first essential is a thorough analysis of his speech before operation and again before commencing training. To do this one must know the proper positions of the organs of speech for the vowels and more especially for the consonants. The classification of consonants in table 1 should prove useful. This classification is twofold, representing (*a*) the organs of articulation, as bilabial, labiodental, etc., and (*b*) the manner of articulation, as plosive, fricative, etc.

Most consonants can be pronounced with or without simultaneous vibration of the vocal cords. If the vocal cords are not vibrating, voiceless consonants, such as P, T, K, F, TH, S and SH, are produced. When the vocal cords are vibrating, voiced consonants, such as B, D, G, V, TH (V), Z, SH (V) and L, are the result. Thus there are pairs of consonants similarly articulated in the mouth but differing in that one of each pair must be accompanied by vibration of the vocal cords; such pairs are P, B; T, D; K, G; F, V; S, Z, etc. There are also voiceless and voiced TH and SH. Thus TH in thin differs from TH in then. The SH sound in pleasure is the voiced equivalent of the SH in she.

It is very difficult by merely listening to a child's speech to tell which sounds are at fault; so it is necessary to test each consonant separately in simple words or syllables. Tests should be made with words in

TABLE 1.—*Classification of Consonants* *

	Bilabial	Labio-dental	Dental	Alveolar	Palato-alveolar	Palatal	Velar	Glottal
Plosive	P B	..	..	T D	..	..	K G	..
Nasal	M	..	..	N	..	..	NG	..
Lateral	..	..	..	L	..	..	..	..
Rolled	..	..	..	R	..	..	..	..
Fricative	..	F V	TH TH (V)	S Z	SH SH (V)	..	..	H
Semivowel	W	..	..	..	..	Y	..	..

* TH, voiceless as in thin; TH (V), voiced as in then; SH, voiceless as in she; SH (V), voiced as in pleasure.

which the consonant occurs at the beginning, at the end and in the middle. It is quite usual to find patients who articulate a consonant at the beginning of a word or syllable but do not articulate it at the end. All the consonants should be tested and the defective ones corrected by appropriate means.

At first it may be necessary to hold the child's nose, or to get him to hold it himself, so that his ear may become trained to the correct sounds. Many of the sounds can be learned by imitation, and the speech trainer must have an accurate knowledge of the positions of the organs of speech for each sound.

Plosives are usually more easily learned than fricatives and should be taught first. It is best to begin with P, B, T and D, as the patient can see and imitate the positions of the organs of speech for these sounds. The voiceless consonants are as a rule more easily learned than the voiced. These general principles also apply to the fricatives and other consonants.

TESTS FOR COMPETENCY OF THE PALATOPHARYNGEAL SPHINCTER

Contact between the soft palate and the posterior pharyngeal wall occurs at a level above the uvula, and it is difficult by inspection alone to determine if the palatopharnygeal sphincter is competent. It is also impossible to see whether it is functioning or not during the articulation of consonants, except possibly K and G. I have seen several patients in whom the soft palate apparently functioned perfectly on articulation of vowels but there was no attempt at movement on articulation of consonants. These patients apparently did not realize that they needed a closure of the palatopharyngeal sphincter except during the articulation of vowels. It is therefore useless to judge the efficiency of the sphincter by simply watching the soft palate while the patient phonates AH. Blowing out the cheeks is equally unreliable, as the patient soon learns to fill up any deficiencies with his tongue. Blowing up rubber balloons is a fairly reliable test, but it does not tell one whether or not the palate is being used for all sounds. The two most simple and reliable tests are (1) the snorting test and (2) the stethoscope test. The former, I think, was first described by Wardill, and I shall give you his description of it: "The patient is instructed to put the tongue slightly out and grip it between the lips. Air is then sucked into the nose as in the impolite act of clearing away pharyngeal mucus. A characteristic sound resembling the snore of a deep sleeper is produced and can be sustained and repeated if pharyngeal closure is attained. I think that the stethoscope test is more reliable for judging the amount of air that escapes nasally and for determining if this escape occurs with all sounds. A small glass tube is used to replace the bell or diaphragm of an ordinary stethoscope. This tube is held under the patient's nose while he is tested for all the vowels and consonants. It can also be used to advantage for an intelligent patient by letting him listen to the escape of air through his nose and comparing this with the absence of this defect in a normal person. The escape of air nasally is indicated by a harsh sound which is very apparent to the ear of the listener.

I shall try to give as briefly as possible the results of our work in the past three years. The accompanying chart shows the progress in eleven of our patients for whom sufficient data are available (e. g., intelligence quotient, etc.).

Patient 1 was first classified in group 1; i. e., there was an escape of air through the nose in the articulation of all sounds, and he did not articulate any of the consonants except M, N and NG. His intelligence quotient was 57.5. In two years he had advanced to group 4; i. e., there was no escape of air nasally but still some defects of articulation. The patient is still in group 4, but he can now articulate practically all sounds correctly in isolation. He still makes mistakes when he attempts sen-

tences, but his speech is fairly understandable. All the patients represented in the chart have shown improvement. Only one of the eleven (no. 17) has, in my opinion, acquired perfectly normal speech. This patient when first seen in 1932 was in group 2. She made some progress in the first year, but in 1933 she was still in group 2. In 1934 she made very rapid progress and reached group 4, and the following year her speech was normal. Six of the others have practically normal speech and are making good progress at school.

Table 2 gives in more detail the progress of seventeen of our patients who have attended the clinic fairly regularly. This table includes the data shown graphically in the chart.

All the patients except two, namely, patients 10 and 15, showed improvement. Patient 10 had an intelligence quotient of 75, but we

TABLE 2.—*Progress of Seventeen Patients*

Case	Age	Group				Intelligence Quotient
		1932	1933	1934	1935	
1	4	1	2 bcd	4 bc	4 b	57.5
2	6	1	2 b	2 b	2 b	56.5
3	8	..	2 abcd	2 bd	2 bd	51.4
4	8	2 bd	2 bd	2 b	3	97.0
5	11	2 d	2 d	3	3	83.5
6	7	2 cd	2 d	3	3	102.0
7	6	..	2 bc	2 b	2 b	72.5
8	8	2 bc	2 b	4 b	4 b	70.0
9	11	2 cd	2 d	3	3	75.0
10	3	2 abcd	2 abcd	..	2 abcd	75.0
11	5	..	2 abd	2 d	4 d	....
12	10	..	..	2 cd	2 d	....
13	17	..	..	2 bc	2 c	....
14	4	..	..	2 c	2 c	....
15	3	1	1	1	1	....
16	4	2 abcd	2 abd	2 b	2 b	....
17	3	2 abcd	2 abd	4 b	5	80.0

did not get any cooperation from the parents and made no progress. Patient 15 was mentally deficient. In four patients in whom there was escape of air through the nose following operation competency of the palatopharyngeal sphincters developed as a result of speech training. Several others have no apparent escape of air nasally on speaking, but it can be detected by the stethoscope test. Five patients mastered all their defects of articulation, and it is interesting to note that they have an intelligence quotient of 75 or over. The age shown in table 2 is the age at which speech training was commenced. It is difficult to say at what age speech training shows the best results, as this varies considerably, depending on the intelligence of the patient. As a rule very little is accomplished before the age of 3, but I think that the patients should be kept under observation from the date of operation.

It is apparent that normal speech is very difficult to attain. So far I have seen only two patients whose speech was absolutely perfect.

However, although this goal is not reached very often, I think one can truthfully say that the speech of these children can be definitely improved by speech training.

RECOMMENDATION

1. Unless a patient with a cleft palate is given a competent palatopharyngeal sphincter by operation before he learns to speak, he will

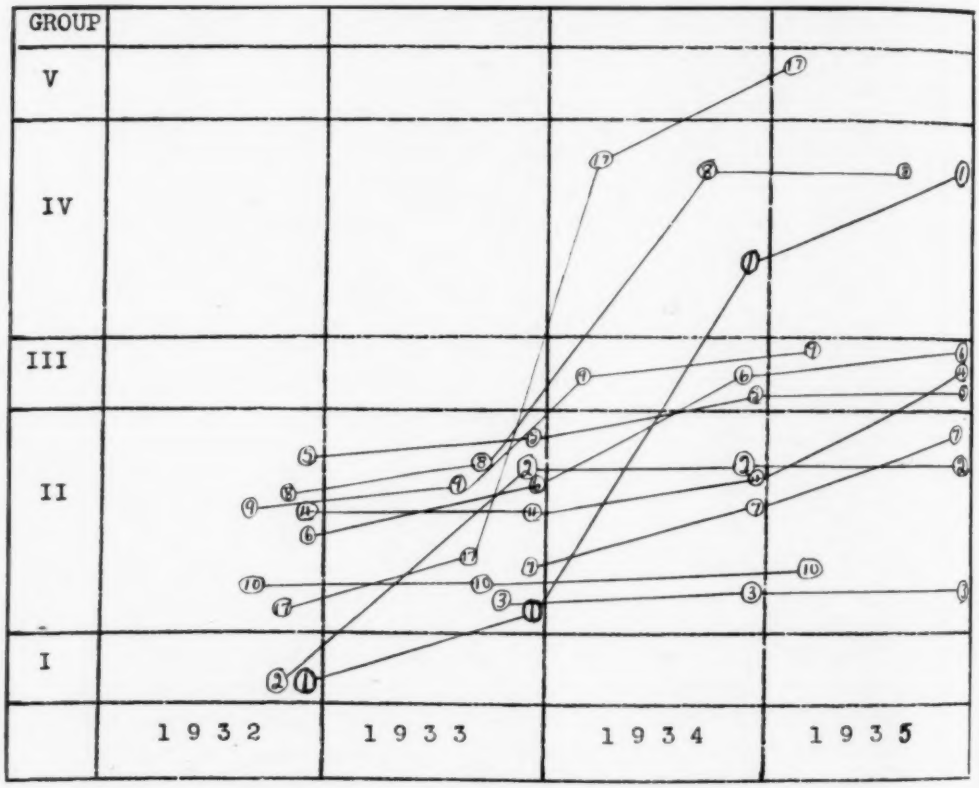

Chart showing the progress of patients with cleft palate in overcoming speech difficulties. Group I includes patients with escape of air nasally and inability to articulate consonants; group II, those with escape of air nasally and defects of articulation; group III, those with only escape of air nasally; group IV, those with only defects of articulation and no escape of air through the nose, and group V, those who have attained normal speech.

acquire defects of articulation, compensatory or otherwise. A competent palatopharyngeal sphincter should therefore be established, if at all possible, before speech habits are acquired. This does not mean that every child requires an operation at or before the age of 1 year. Many

children are backward and make no attempt to talk till much later than this, and the older the child, the less the chance that operation will prove fatal. One must therefore adjust the date of operation to suit the individual case.

2. The patient should have a complete analysis of his speech before operation if he has already begun to talk, and also before beginning any period of speech training.

3. The patient, if old enough, should begin postoperative speech training as soon as the palate is completely healed. If he is too young for training he should report at least once a month for observation. This gives the instructor an opportunity to advise the parents, and at the same time the child becomes accustomed to attending the clinic.

4. Observing the action of the palate by means of a mirror is the best method of improving the function of the palatopharyngeal sphincter.

5. If for any reason operation has to be postponed until after the child learns to talk, speech training should be started in the interval.

6. The period of training depends on the intelligence of the patient, but there should be a frequent check-up, as there is a tendency for such patients to return to their old habits. Two years of fairly constant observation is, I think, a minimum in most cases, and after that there should be a check-up every one or two months for an indefinite period.

7. Cooperation of parents and teachers is essential and is a very important factor in the ultimate success and in determining the duration of the period of training required.

SPEECH TRAINING FOR PATIENTS WITH OTHER ORAL CONDITIONS

Other oral conditions which are frequently of interest to the speech trainer are: tongue-tie, enlarged tonsils and adenoids, irregular teeth and injuries to the soft palate.

Tongue-tie and enlarged tonsils and adenoids are, in my opinion, very much overrated as causes of defects of articulation. I have never seen a patient in whom a short frenulum was the cause of lisping (TH for S) or other defects. As a matter of fact, the tongue requires more freedom of movement for the articulation of TH than for S. I think, therefore, that the operation of cutting the frenulum linguae to improve speech should be discarded except in rare cases. Enlarged tonsils and adenoids can cause a typical speech characterized chiefly by lack of nasal resonance, but it is a mistake to advise patients to have the tonsils and adenoids removed for correction of defects of articulation alone. Too often one hears the following history: "My child could not say certain words correctly, and I was advised to have his tonsils and adenoids out."

Although defects of articulation are sometimes found in patients who have badly deformed teeth or alveoli, I think that it is a mistake to conclude immediately that the one is the result of the other. One should keep in mind the number of persons who have very marked deformities of the teeth and no defects of articulation. The point I wish to stress is that patients with the aforementioned conditions should have an analysis of their speech to determine if the defects of articulation are due to the deformities or to faulty position of the tongue during articulation.

Injuries to the soft palate present a problem in many ways similar to that of cleft palate. They usually occur in older children who have mastered the problems of articulation, and so defects of articulation are not usually present. Escape of air through the nose, however, is very frequently a result of even slight injuries to the palate, especially in children. Owing to the pain caused by movements of the injured palate, the child quickly learns to articulate without any movement of his palatopharyngeal musculature, and the result is escape of air nasally with all sounds. This condition is liable to persist after repair and healing have taken place. The escape of air through the nose in these cases, therefore, is due not only to the resulting scarring and shortening of the palate but also to the fact that the patient has acquired a new speech habit. He has forgotten how to use his palatopharyngeal sphincter. The treatment is the same as that used in the postoperative therapy of cleft palate. The patient must be encouraged to direct the air stream through the mouth instead of through the nose. I think that in these cases, if the child is old enough, electrical stimulation of the palate is useful. However, I think that the best exercise is to have the patient watch the movements of his own palate in a mirror at least two or three times daily. For these patients, as for patients suffering from cleft palate, treatment should not be delayed until bad speech habits are firmly established.

Miss Budden, Miss Hyde, Mrs. Ismay and the Province of Quebec Society for Crippled Children gave willing and valuable assistance in this work.

ABSTRACT OF DISCUSSION

DR. V. H. KAZANJIAN, Boston: In cases of cleft palate some of the anatomic structures involved in speaking are deficient. The most important deficiency is associated with the soft palate, which in most cases, even if operation is successful, is shorter and stiffer than the normal palate. This is not the only defect. Some patients, especially adults, have marked distortion and irregularities of the teeth and defects of the upper lip and nose which undoubtedly contribute to the difficulty of their speech. When the patient does not have the best functioning machinery he naturally tries to use whatever means he is equipped with, and as a result the physiologic coordination of the various tissues which enter into the mechanism of speech is not perfect. Then, also, some parts remain underdeveloped while others become overdeveloped. For instance, many children with defective speech do not

make proper use of the tongue. Again, some patients do not make proper use of their lips. In other cases the muscles of the pharynx, especially the superior constrictor muscle, seem to be very active. This is often seen in patients who have not been operated on for repair of the palate.

Patients with cleft palate, especially adults, develop a false sound image; that is, their ears are not properly trained to be conscious of their own improper speech. Therefore, it seems to me that the first step in training these patients is to educate their ears to distinguish defective speech from the normal. Unless they are made conscious of this fact, there will be no intelligent effort on their part to correct their speech.

The second step is to teach them the correct use of the tongue and lips. Dr. Scharfe has given an excellent outline of his method of approach. However, above everything else it is highly important to equip the child with as good an anatomic mechanism for speech as is possible with surgical measures or prosthesis. For this reason it is important to correct the minor or major defects of the palate, nose and teeth. From this point of view the surgeon cannot dodge the responsibility by merely turning the child over to a teacher for speech training.

However, it is gratifying for surgeons to see patients not equipped with a long palate gradually learning to speak properly under proper supervision. For this reason, Dr. Scharfe's contribution is instructive and timely.

Dr. G. M. Dorrance, Philadelphia: A peculiar thing about the patient with a cleft palate is that he does not distinguish between his speech and that of a normal person. The normal child is taught to speak gradually, or develops speech by self-instruction. The child with a cleft palate goes through the same motions of speech as the normal child but does not produce the same sound. That is the real difficulty.

The attainment of good speech in cases of cleft palate requires complete velopharyngeal closure. Such closure is obtained by an operation which permits the velum to come into contact with the pharyngeal wall, so that the "palatopharyngeal sphincter" shuts off the nasopharynx. The more efficient the closure, the more satisfactory the speech.

The essential factor, then, is reconstruction of the sphincter. The operator must select an operation that in the individual patient before him will produce this closure. Unless the operative procedure undertaken results in velopharyngeal closure, so far as good speaking voice is concerned it is a failure.

When the palatopharyngeal sphincter contracts, it shuts off the nasopharynx from the oropharynx. In cases of cleft palate the anterior segment of the muscle forming the pharyngeal ring is split, and the separate ends are far apart.

I advise operating on the child with cleft palate in the fourth or fifth year. I have had no deaths, no complete failures and seldom any partial failures and no large sloughs. The older the child, the thicker the palatal tissues. If a good velopharyngeal closure is not obtained, it makes little difference when one starts speech training, but if pharyngeal closure is good, speech becomes satisfactory whenever training is started.

The teeth should be regulated, and openings in the dental arch must be corrected before proper speech can be expected.

Success comes easier and more frequently to a team of surgeons, dentists and instructors in speech.

Dr. Ernest E. Scharfe, Montreal: I wish to stress that it is necessary to use a standard classification of speech when reporting results of treatment of cleft

palate and that defects in articulation should not be neglected in the treatment. From the patient's point of view, the correction of these defects is as important as eliminating the escape of air nasally. All have seen patients with cleft palate with defects in the palate, and yet their speech was understandable. On the other hand, I have at least two patients who have perfect palatopharyngeal sphincters and whose speech is not understandable, owing to defects in articulation alone. So my plea is that a standard classification for speech be adopted when reporting results.

A NEW PROCEDURE FOR THE TREATMENT OF WEB IN THE LARYNX

REPORT OF A CASE

SAMUEL IGLAUER, M.D.
CINCINNATI

A web or diaphragm in the larynx may either occur congenitally or be acquired in the form of adhesions following injury to, or ulceration of, the laryngeal mucosa. A congenital web almost invariably occurs in the form of a membrane uniting the vocal cords at the anterior commissure and extending backward for a variable distance. According to Himmelreicher,[1] Radasch [2] and others, the congenital web represents an arrested development of the larynx. In the embryo the division between the air and the food passage is present during the middle of the second month. In the larynx the two arytenoid mounds and the future vocal cords are in approximation and begin to separate from behind forward during the third month. The failure or arrest of this process leads to the presence of a congenital web. The web is always thickest at the anterior commissure and tends to thin out toward the posterior free border. It is covered with epithelium on both its upper and its under surface, and may contain connective tissue, muscle fibers, glands and cartilage.

A perusal of the literature shows that a congenital web is of very infrequent occurrence. An acquired diaphragm, resulting from the formation of scar tissue within the larynx, may occur in any portion of the lumen. Adhesions may unite the vocal cords, but the most common obstruction is usually found in the subglottic area.

The symptoms pointing to the presence of a laryngeal web vary with the site and extent of the obstruction. There is more or less interference with the production of voice, stridor may be present and dyspnea may become manifest on exertion. Indirect or direct laryngoscopy reveals the presence of the obstruction.

TREATMENT

A review of the more recent literature shows that the treatment of webs uniting the vocal cords has not been very satisfactory and that

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From the Department of Otolaryngology, College of Medicine, University of Cincinnati.

Read before the meeting of the American Laryngological Association, Toronto, Canada, May 31, 1935.

1. Himmelreicher, G.: Kongenitale Stimmbänderverwachsung, Arch. f. Ohrenh-, Nasen- u. Kehlkopfh. **101**:169, 1917.

2. Radasch, H. E., quoted by Clerf.[3]

mere division of the web in the midline has usually been followed by the reformation of the adhesion, especially at the anterior commissure, where the web is thickest and the motion limited.

McKenzie [3] expressed the following opinion:

> When discovered accidentally and causing no symptoms—the usual event—it is better left alone. If stridor, dyspnoea, or hoarseness necessitate treatment, the structure may be cautiously destroyed by diathermy cauterization. Simple incision affords only temporary relief as the web reforms, and removal through thyrofissure opening is no better. After its destruction the glottis should be kept patent by a vulcanite tube.

Hodge [4] recorded a case of a web in a 9 year old boy. He made an incision along one cord and then used metal dilators repeatedly. After two months there was a slight reformation of the web at the anterior commissure. The web was again incised and weekly dilations carried out, with no evidence of recurrence. The voice gradually improved, but the patient remained somewhat hoarse.

At the 1931 meeting of the American Laryngological Association, Clerf [5] reported three cases of congenital stenosis. Two of the patients were infants and were successfully treated by division of the membrane, combined with tracheotomy and repeated dilations to keep the incised edges apart.

Schröder [6] employed laryngofissure with excision of the diaphragm. He then sutured the mucosa over the raw surfaces remaining after the removal of the web. The stitches pulled out on one side, adhesions reformed, and the patient was discharged with the anterior third of the cords reunited.

Kriegsmann [7] reported a case in which at intervals he employed the knife and punch, the diathermy knife and coagulation and finally repeated incisions and daily bouginage. He came to the conclusion that he would recommend surgical measures for a congenital web only as an operation of necessity and would not expect an ideal result but would be content with dividing the web in its thin posterior portion. With "thick membranes" he would advise laryngofissure with removal of the web and keeping the larynx open until healing had occurred.

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3. McKenzie, D.: Diseases of the Throat, Nose and Ear, St. Louis, C. V. Mosby Company, 1928, vol. 1, p. 110.

4. Hodge, G. E.: Congenital Web of the Larynx, Canad. M. A. J. **22**:535 (April) 1930.

5. Clerf, L.: Congenital Stenosis of Larynx, Tr. Am. Laryng. A. **53**:207, 1931.

6. Schröder, K.: Ueber 3 Fälle von stenosierender Kehlkopfmissbildung, Ztschr. f. Hals-, Nasen- u. Ohrenh. **28**:182, 1931.

7. Kriegsmann, G.: Zur operativen Behandlung des Diaphragma Laryngis Congenitum, Ztschr. f. Hals-, Nasen- u. Ohrenh. **33**:218, 1933.

Beck [8] came to a similar conclusion. He stated that "various methods of treatment of laryngeal diaphragms have hitherto not been completely satisfactory." He reported an unusual case in a 16 year old girl who had been operated on in 1921 and again in 1932, with a recurrence of all her symptoms by the following year. He therefore performed laryngofissure and inserted a rubber tube for three weeks, after which the opening was closed. Eleven months later the glottis was free, but there was firm cicatricial tissue at the anterior commissure.

A year ago Wilkinson [9] reported a case in which a midline incision was made and bouginage employed. Subsequently a second incision became necessary. The final result showed the glottis about four-fifths patent.

In Tucker's [10] recent case repeated incisions were found to be necessary to prevent adhesions, and at the time his article was written there was still some fusion of the cords at the anterior commissure, for which further incisions were recommended.

In addition to the methods of treatment mentioned here, Haslinger [11] succeeded in preventing the reformation of adhesions by inserting a small silver plate between the severed tissues, but this method carried with it some danger of exciting perichondritis.

Jackson [12] advocated an incision to release the web on one side only, followed by daily endoscopic dilation to prevent union. Later, if necessary, the redundancy on the other side was removed.

Arbuckle [13] recommended the use of surgical diathermy as a means of destroying scar tissue within the larynx.

A few months ago a patient with a cicatricial web between her vocal cords came under my care. Mindful of the uncertain results achieved by the usual methods of treating a laryngeal web and considering the analogy between webbed fingers and a laryngeal diaphragm, I decided to apply the principle of the two stage operation sometimes employed by the general surgeon for the treatment of syndactylism. This consists

8. Beck, K.: Ueber eine operative Behandlung des sogenannten Diaphragma des Kehlkopfes, Ztschr. f. Hals-, Nasen- u. Ohrenh. **35**:303, 1934.

9. Wilkinson, R. W.: Congenital Stenosis of Larynx, J. A. M. A. **102**:1756 (May 26) 1934.

10. Tucker, G.: Congenital Web of the Larynx, Arch. Otolaryng. **21**:172 (Feb.) 1935.

11. Haslinger: Synechie im vorderen Anteil der Stimmbänder, Zentralbl. f. Hals-, Nasen- u. Ohrenh. **8**:496, 1926.

12. Jackson, C.: Personal communication to the author; Surgery of the Larynx and Trachea and Endoscopic Surgery of the Bronchi, in Lewis, Dean: Practice of Surgery, Hagerstown, Md., W. F. Prior Company, Inc., 1930, vol. 4, chap. 7, p. 5; Peroral Endoscopy, St. Louis, Laryngoscope Company, 1915, p. 430.

13. Arbuckle, M.: Treatment of Cicatricial Stenosis of the Larynx, Tr. Am. Laryng. A. **54**:63, 1932.

in passing a wire through the proximal portion of the web between the fingers and leaving the wire in place until the epithelium has grown through from both surfaces, forming a new commissure. At the second operation the web between the fingers is completely divided, the epithelium-lined commissure preventing adhesions from reforming.

REPORT OF CASE

History.—Mrs. A. F., aged 26, came to me for treatment on Dec. 6, 1934. Her chief complaint was hoarseness. She stated that she had been treated for laryngeal papillomas beginning at the age of 4½ years. The papillomas had been removed on fifty-two occasions over a period of from two to three years.

About eighteen months after treatment had been started, a tracheotomy tube had been inserted and had been worn for two years. After insertion of the tube no further laryngeal treatments were given, and she was pronounced free from papillomas at the age of 7½ years. There had been no treatment thereafter. There was a history of typhoid and diphtheria without any residua.

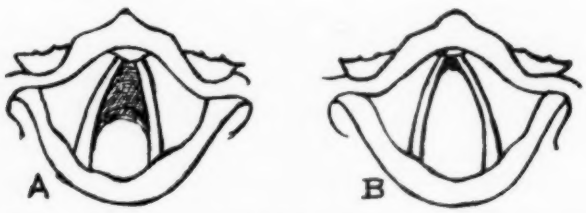


Fig. 1.—*A*, a sketch of the cicatricial web between the vocal cords. *B*, the appearance of the larynx about two months after operation. (Sketch by Dr. John Myers.)

A tonsillectomy was performed under ether anesthesia in June 1934 and the patient was told that she took the anesthetic very poorly, and had required inhalations of carbon dioxide and oxygen together with injection of epinephrine as restoratives.

General physical examination revealed nothing bearing on her case. Wassermann, Hecht-Gradwohl and Kahn tests (taken later) were all negative.

Examination.—The patient was well developed and well nourished. She was of a rather nervous temperament. A vertical keloid scar was present at the site of the former tracheotomy. Her voice was low-pitched, coarse and hoarse. She spoke with some effort. There was no dyspnea or stridor unless she became excited. She cleared her throat frequently, but was free from cough. Mirror examination of the larynx showed normal false vocal cords and arytenoid cartilage without impairment of the movements of the cartilage. There was a well defined web between the vocal cords, extending from the anterior commissure to the middle of each cord (fig. 1 *A*). The free border of the web was thin, crescentric and whitish. The remainder of the web had the color of the laryngeal mucous membrane. The web apparently increased in thickness toward the anterior commissure. Laterally, it fused with each cord. On phonation, it folded up between the cords. There were no papillomas in the larynx.

Operation.—On December 7, with the area under cocaine anesthesia, a Haslinger directoscope was introduced, and a knife puncture was made through the web near the commissure. (A specially modified Bard Parker knife and handle were used for this purpose.) A spring ring (from a watch chain), to which a long piece of thin copper wire had been soldered, was held open by a laryngeal forceps and inserted through the puncture. The spring was then released, closing the ring. The attached wire was brought out through the pharynx and nose. A piece of rubber tubing was slid over the wire, which was held in place with adhesive plaster attached to the cheek (fig. 2).

During the following week the patient complained of some soreness in the throat, occasional gagging, a slight cough and some difficulty in swallowing. On the fifth postoperative day a roentgenogram of the neck was taken. This showed

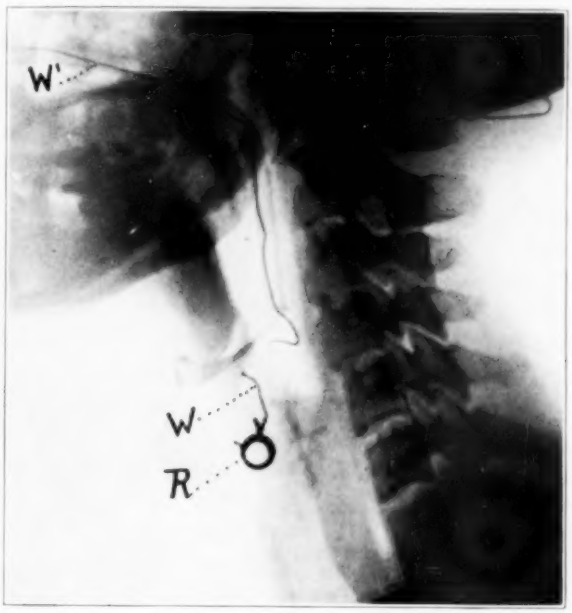


Fig. 2.——A lateral roentgenogram showing the spring ring anchored in the laryngeal web. *R* indicates the ring; *WW'*,[1] the wire.

the ring in good position within the larynx, but the wire had broken (fig. 2). It therefore became necessary to remove the ring. This was done the following morning, at which time the second operation was performed.

On December 13 the larynx was cocainized by the drop method, and a Haslinger directoscope was inserted. When cocaine was applied through the directoscope the ring became detached and was removed with a forceps. The web was then excised by a V-shaped incision beginning at the hole left by the ring, and small remaining fragments were removed with a punch forceps. The piece removed measured approximately 8 mm. in diameter and varied from 1 to 2 mm. in thickness. The microscopic report read: "Dense, highly vascular, subacute and chronically inflamed fibrous tissue, covered in part by epithelium, some of which appears to be proliferative in character. There are several small areas showing epithelial erosion of an ulcerative character."

Subsequent Course.—Following the second operation there was a slight tendency for the adhesions to reform near the anterior commissure. In order to counteract this, four days after the web had been excised an O'Dwyer intubation tube was inserted and allowed to remain for two days. Thereafter the intubation tube was inserted for from one to two hours at intervals of from four to seven days. The patient was advised to practice vocalization with her voice placed at a higher pitch. At the end of a month she was dismissed. At that time she spoke with less effort, and her voice was improved but was still hoarse and low-pitched. A slight adhesion (about 1 mm.) was still present at the anterior commissure.

Through the kindness of Dr. John Myers, the patient was reexamined in Kansas City, where she resided. About two months after operation he reported that there was a web of from 2 to 2.5 mm. in the anterior commissure (fig. 1 *B*) and that the cords moved and coapted properly, but that her voice was "husky and heavy."

Four months after operation the patient wrote: "I have spoken aloud several times. This strange, new voice is at its best in the morning. In the evening it is almost entirely gone. This voice sounds as though I was recovering from laryngitis. . . . It seems funny to possess two voices."

COMMENT

By the method of treatment employed in this case, a very fair but not entirely perfect anatomic and functional result was obtained. As stated previously, the breaking of the wire attached to the ring rendered it necessary to remove the latter before the time originally planned. Within limits, the longer the ring can be retained the better the chances of obtaining an epithelium-lined commissure, which is essential for the success of this procedure. If I repeat this operation on another patient, I shall allow the ring to remain in the larynx for about three weeks and shall use a piece of braided silk instead of wire to anchor the ring. This will be more comfortable for the patient.

It is questionable whether the ring technic could be carried out on an infant without resorting to tracheotomy as an adjuvant.

SUMMARY

A review is given of the various methods of treatment of a laryngeal web as reported in the more recent literature.

A new, two stage procedure, based on an operation for syndactylism, has been applied to the treatment of a laryngeal web.

The operation consists of inserting an indwelling spring ring through a puncture in the web at the anterior commissure.

After epithelization has occurred about the ring, the web is removed by a V-shaped excision with its apex at the newly formed commissure.

A case is reported in which this technic was carried out.

707 Race Street.

STAPLES AND DOUBLE-POINTED TACKS AS FOREIGN BODIES

MECHANICAL PROBLEMS OF BRONCHOSCOPIC EXTRACTION

CHEVALIER JACKSON, M.D.
AND
CHEVALIER L. JACKSON, M.D.
PHILADELPHIA

A double-pointed object requires no definition; its name is definitive. The reason it requires separate classification arises from the peculiar and enormously greater difficulties of safe endoscopic removal as compared with those of removal of single-pointed objects. Staple is the name applied to a double-pointed nail used for fastening wires to wood Double-pointed tacks are used chiefly for laying floor matting. Double-pointed wires used in machine-made baskets, automobile upholstery pins, some kinds of paper-clips, metal fasteners and some kinds of hairpins belong in the same category.

From the all-important point of view of the solution of the mechanical problem of peroral bronchoscopic removal there are two classes of bodies, the bendable and the unbendable. Figures 1, 2 and 3 give a good example of the bendable class. Figures 5, 10, 11, 12, 13, 14, and 15 are good illustrations of the unbendable and unbreakable type.

INCIDENCE AND ETIOLOGY

From the literature one would suppose that double-pointed objects are rare as foreign bodies, but in the annals of the bronchoscopic clinic they seem to be not uncommon. There are in our records fifty-one cases of double-pointed objects as foreign bodies, of which twenty-seven have been of the unbendable, unbreakable class: in twenty-four cases the type was unclassified.

As noted many years ago,[1] one of the fundamental causes of foreign body in the air and food passages is carelessness in putting inedible substances in the mouth. Staples and double-pointed tacks occurred as foreign bodies as the result of being put in the mouth (*a*) by children who used them as toys or (*b*) by adults who held the staple or the double-pointed tack in the mouth while waiting to drive it in the course of work. One remarkable case of the latter group may be cited.

Case 3051.—A man aged 56 was standing on top of a step-ladder substituting staples for nails in a ceiling. He was holding in his mouth two staples and a

1. Jackson, Chevalier: Foreign Bodies in the Larynx, Trachea, Bronchi and Esophagus Etiologically Considered, Tr. Sect. Laryng. Otol. & Rhin., A. M. A., 1917, p. 36.

nail with which to make holes to facilitate driving in the staples. In pulling an old nail from the ceiling with pliers the nail came away so suddenly that the patient fell from the ladder, and in so doing he inspirated into the tracheobronchial tree the two staples and the nail he was holding in his mouth (fig. 15).

No case of a staple as a foreign body has so far occurred as the result of accidental presence in food.

Prophylaxis is simple in principle. If no one put such inedible things in his mouth these accidents with foreign bodies would not occur. In practice, however, many difficulties are encountered. The slack oversight many parents give their children, the difficulty of eternally watching the very young child, force of habit in adults and ignorance of danger on the part of parents and workmen all call loudly

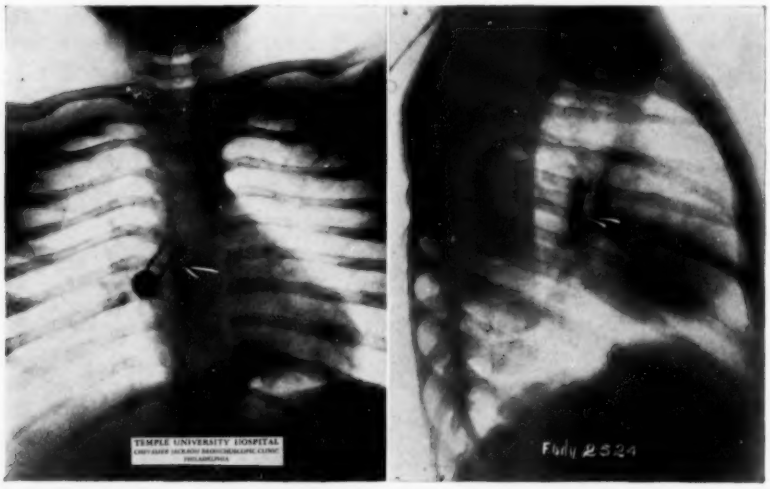


Fig. 1.—A double-pointed automobile upholstery pin lodged points upward in the bronchus of the right lung of a boy aged 10 years.

for a campaign of education in the prevention of these and other accidents with foreign bodies. Very young children should not be permitted to play with such potentially dangerous objects, and older children should be taught not to put them in the mouth.

PATHOLOGIC CHANGES

When a staple first reaches a bronchus the local reaction is moderate because the foreign body is of metal and is not obstructive; there is free by-passage space for ventilation and drainage. Before long, however, because of the hereinafter mentioned characteristics the staple works a little deeper and the points become covered with a proximal annular edema that hides the view of the points as approached with the bronchoscope from above (fig. 5). The foreign body undergoes

changes; the galvanizing or tinning, if either is present, is soon lost by galvanic action [2]; the steel corrodes rapidly, and its roughened surface introduces infection under the epithelium, the mucosa swells, granulations form and the by-passage spaces are obliterated. This obstruction to ventilation and drainage soon results in suppuration in the tributary area of the lung. At first the condition is one of drowned lung; that is, the pus is contained in the normal passages. If the foreign body is not removed the walls of the natural passages break down and pulmonary abscess results. The suppuration is almost invariably foul. We have noted [3] in cases of prolonged sojourn of the foreign body a remarkable resistance to suppurative invasion by the bronchial route as compared with that by the lymphatic or the vascular route. We have evidence also that metallic substances in the bronchi in undergoing oxidation inhibit the suppurative process by

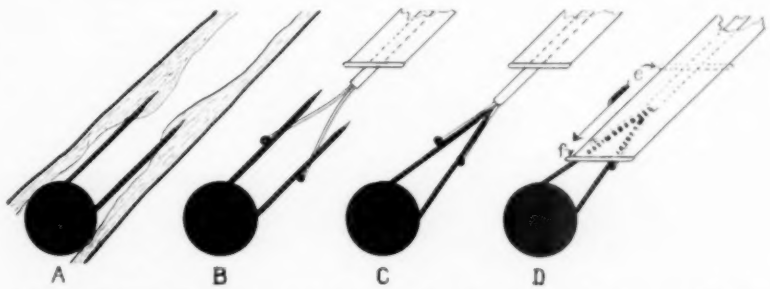


Fig. 2.—Schema illustrating the solution of the problem of the bendable type of double-pointed foreign body presented in figure 1. At *A* is indicated how elongation and shortening of the bronchi have buried the points in the mucosa; to make traction would drive these diverging points outward through the bronchial wall, frustrating removal and inflicting serious trauma. A slight push downward is sometimes necessary to release the points. At *B* is illustrated the application of the approximation forceps. At *C* the points are approximated. At *D* the bronchoscope is shown pushed from *e* to *f* down over the approximated points, safely sheathing them for withdrawal. Note that the sheathing is not done by traction on the forceps.

ionization.[2] The pathologic changes in the tissue and their relation to the changes in the foreign body itself have been considered elsewhere.[4]

2. Jackson, Chevalier: Observation on the Pathology of Foreign Bodies in the Air and Food Passages Based on the Analysis of Six Hundred and Twenty-Eight Cases, Surg., Gynec. & Obst. **28**:201 (March) 1919.

3. Jackson, Chevalier: (*a*) Suppurative Diseases of the Lung Due to Inspirated Foreign Body Contrasted with Those of Other Etiology, Surg., Gynec. & Obst. **42**:305 (March) 1926; (*b*) Peroral Endoscopy and Laryngeal Surgery, St. Louis, The Laryngoscope Company, 1915. (This book is out of print, but is in most libraries. The French translation, entitled "Endoscopie et chirurgie du larynx," is still obtainable from the publisher, Gaston Doin, Paris). Footnote 2.

4. Jackson, footnotes 2 and 3.

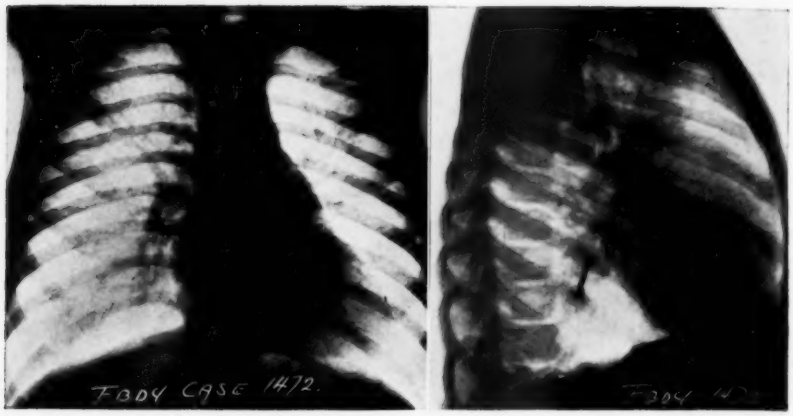


Fig. 3.—Roentgenograms showing a double-pointed fastener lodged point upward in the bronchus of the lobe of the left lung of a boy aged 11 years. The foreign body being bendable, the points were made one by approximation and were then sheathed in the mouth of the tube for withdrawal. The foreign body had been in the lung three and one-half years, yet, being of brass, the corrosion of the metal had not been sufficient to dull the sharpness of the points or to cause breakage.

Fig. 4.—Roentgenogram of a baby aged 8 months, showing a double-pointed bassinet wire fastener entangled in the walls of the cervical esophagus. All instrumentation was contraindicated for ten days after admission. The swollen tissues full of air had almost asphyxiated the baby. The subcutaneous emphysema and cellulitis were due to alternate pulling and pushing on the foreign body before admission. The mechanical problem was of one point resisting upward traction and another resisting the downward propulsion necessary to free the penetrated upward point. The solution was to free and sheathe the upper, straight point; the curved point did not resist upward traction. This case is illustrative of contraindications to the approximation method.

SYMPTOMATOLOGY AND PROGNOSIS

It is fundamental to remember that the symptoms presented depend largely on the stage at which the patient is seen. The patient may be entirely symptomless or he may be moribund from prolonged chronic sepsis with or without exsanguinating hemorrhages. The initial symptoms are coughing, choking and gagging; these are practically never absent, but in children they may go unobserved. The cough subsides in a few minutes or hours; then follows a prolonged symptomless interval. After a few weeks or months productive cough develops, and the sputum is increasingly purulent, foul and blood-tinged. Pallor and emaciation progress, and clubbed fingers and watch-crystal nails complete the syndrome of chronic pulmonary sepsis. In the early stages there is usually no fever; later the temperature is of the daily fluctuating septic type, usually with a moderate high point. The pulse ranges rela-

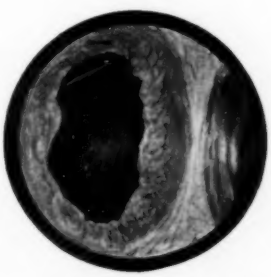


Fig. 5 (case Fbdy. 409).—The patient was a man aged 43. The illustration gives a bronchoscopic view of a large fence staple of galvanized steel which had been in the main bronchus of the left lung for two years. Acute edema due to previous efforts at removal masked the chronic lesions somewhat. Localized bronchitis and perichondritis were present. The ring of reddish swelling hiding the upward-projecting points was fibrous inflammatory tissue. There were granulations deeper down below the fibrous ring where the staple had been lying. The points were removed by means of the bronchoscope through the mouth by cephalic version, the points being disembedded, brought upward and turned down into the bronchus of the right lung, the orifice of which is shown to the right. The limitation of the inflammation after two years was remarkable. The carina was not thickened, and the right bronchial orifice was normal.

tively to the range of temperature. Respirations, unaffected in the early stages, increase in rate later. Leukocytosis is usually less in degree than in most other suppurative pulmonary conditions.

There is no immediate danger to life, but ultimately the secondary pulmonary suppuration will prove fatal. The prognosis as to removal is good; all such objects can be removed through the mouth, practically without mortality if no injudicious efforts at removal have previously created potentially fatal complications.

MECHANICAL PROBLEMS OF ENDOSCOPIC EXTRACTION

The fundamental principle in dealing with all pointed objects is that advancing points perforate whereas trailing points are relatively harmless (fig. 7). As with single-pointed objects, we have worked out methods of dealing with double-pointed objects that are almost always successful, and when used with care these methods have practically eliminated all danger to the life of the patient.

Bendable and Double-Pointed Objects.—The characteristic of foreign bodies of this class is that, the foreign body being bendable, the two points may be approximated and may thus be made one (figs. 1, 2 and 3). This one, combined point may be sheathed with the mouth of the tube or otherwise before it is advanced upward. Double-pointed pins, paper-clips and metal clips are common examples of foreign bodies to which this approximative technic is well adapted. Hair pins con-

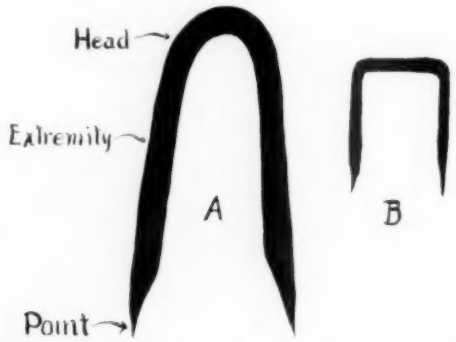


Fig. 6.—Illustration of the nomenclature given to parts of the staple (*A*) and the double-pointed tack (*B*) useful for brevity and clearness of description of manipulations in the solution of mechanical problems of endoscopic removal of foreign bodies. The curved part is called the head because it is where the hammer strikes, and it corresponds to the head of a nail. The extremities of the staple diverge at a small angle. The extremities of the double-pointed tack are parallel. Either object may have been deformed before it became a foreign body; the points may be eaten away by oxidation after a long sojourn. It is well to learn of such changes by roentgen examination before planning the technic of removal.

sidered as foreign bodies are of two kinds. The standard model, with two separated and sharpened points, when lodged points upward, as it usually is, requires approximation and sheathing of the points before removal.[2] The recently devised "bobette" or sliding pin has two ends, but they are tightly approximated and moreover are not potentially traumatizing because they are not pointed. These pins as foreign bodies have been considered elsewhere.[5]

5. Jackson, Chevalier, and Jackson, Chevalier L.: Bronchoscopy, Esophagoscopy and Gastroscopy, ed. 3, Philadelphia, W. B. Saunders Company, 1934.

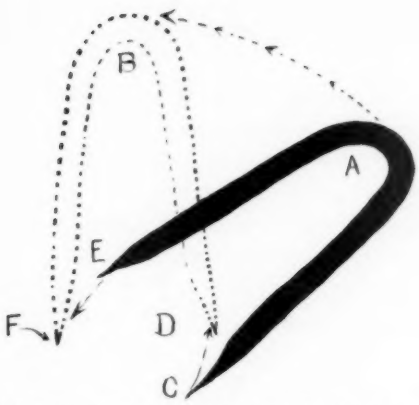


Fig. 7.—Schematic illustration of the fundamental principle of safety in dealing with sharply pointed foreign bodies, namely, "advancing points penetrate; trailing points do not" (Jackson, C.: Ann. Surg. **75**:1, 1922; footnotes *3b* and 5). If the staple, *A*, is rotated in the plane of the extremities in the direction indicated by the curved darts the point, *E*, becomes an advancing point; it rips in at *F* and will penetrate if movement is continued. On the other hand, the same movement of the foreign body, at the same time, causes the other point, *F*, to retreat to *E*, its relation to the tissues becoming a trailing point with no danger of trauma so long as movement continues in this direction. Therefore, during version in the direction of the curved darts *A* to *B*, the point *C* may be disregarded as harmless because its movement is trailing. On the other hand, the point *F* must be guarded with utmost care because the same movement of the foreign body that causes the point *C* to trail causes the point *F* to advance. If point *E* is properly controlled, complete version in the plane of the extremities may be safely accomplished and the foreign body delivered by the head with points trailing.

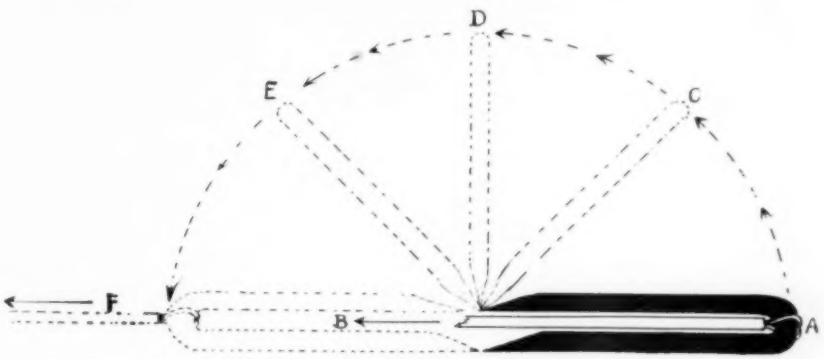


Fig. 8.—Schematic illustration of cephalic version vertical to the plane of the extremities. When traction on the head of the staple *A* is made by the forceps in the direction of the dart *B* both points are advancing points; they rip into the tissues and come to a standstill. Continuation of traction causes the head to rise vertically to the plane of the extremities until position *C* is reached; then, if traction is continued version is completed (*D*, *E* and *F*) and results in delivery by the head, in the direction of the dart *F*, with both points trailing. Obviously, considerable penetrating pressure is put on the wall of the bronchus by the points. If the length of the staple exceeds by more than 3 mm. the transverse diameter of the passage invaded the danger increases in direct proportion to the length. The rotation forceps are used for this; they must be perfectly adjusted.

Unbendable, Unbreakable, Double-Pointed Foreign Bodies.—The foreign bodies in this class most frequently encountered are staples and double-pointed tacks—especially staples (figs. 5, 10, 11, 12, 13, 14 and 15). These may cause fatal results if removal is attempted without a perfect conception of the potentially fatal character of the foreign body when manipulated. Their characteristics are: 1. They are made of rigid steel to render it possible to drive them into wood. 2. The points are very sharp and penetrate easily because they are triangular in cross-section like surgical needles. 3. The branches in most instances diverge at a small angle directing the points toward the walls of the

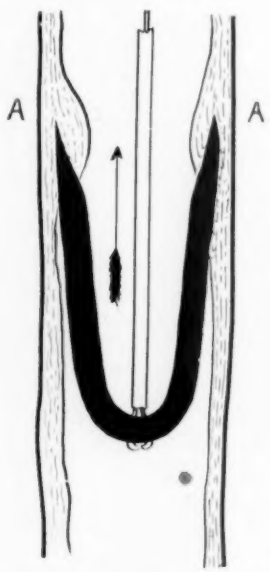


Fig. 9.—The points *AA* of a staple are almost always buried because of the elongation and shortening of the bronchi or, sometimes, because of injudicious traction in the direction of the dart. Compare with figure 5.

invaded passage, which renders the points certain to rip into the walls if traction is made. 4. The shape of the foreign body favors its working deeper into the tracheobronchial tree by a ratchet-like action. Under enlargement and diminution of the lumen and elongation and shortening of the bronchi at each respiratory cycle and at each cough the head slips down easily, but upward movement of the foreign body is prevented by the points ripping into the bronchial wall; the result is that the foreign body is forced down into the smallest bronchus it can enter and the points are buried below a proximal ring of edema, so that through the bronchoscopy only the central part of the head is seen (fig. 5).

When traction is made on a staple lodged point upward, because of the divergence of the extremities one or both of the points almost always enter the bronchial wall, preventing upward movement of the foreign body. To release the foreign body it is necessary to push downward, and unless great care is taken it will be pushed to a lower position than it previously occupied. Patients have come to our clinic with staples that by repeated pushing and pulling have been forced toward the periphery as far as their size would permit them to be pushed; this enormously increased the difficulties of safe disentanglement, though in no case has safe bronchoscopic removal been rendered impossible.

Corrosion may have destroyed the points of a staple so that they do not catch in the bronchial wall. In such cases the foreign body

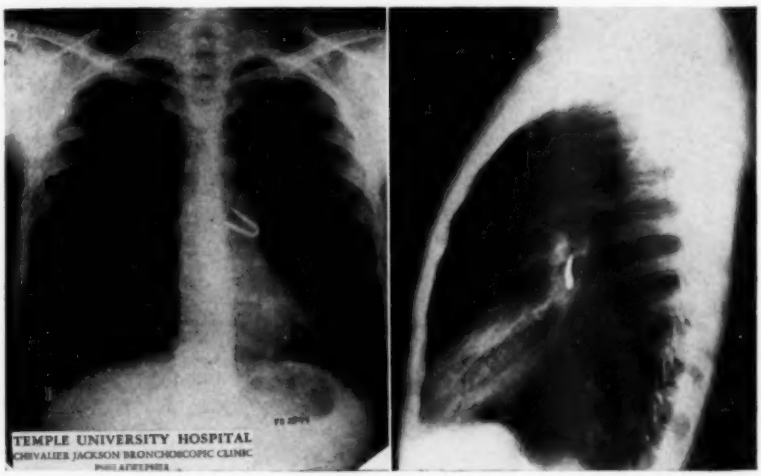


Fig. 10 (case Fbdy. 2944).—Anteroposterior and lateral roentgenograms of a boy aged 17 showing a large staple in the bronchus of the left lung. The history indicated that it had been lodged in the orifice of the left bronchus two years previously and had worked downward to the position indicated here. It was embedded in a suppurating bed surrounded by granulation tissue. Removal was accomplished through the mouth by means of a bronchoscope after cephalic version. The divergence of the extremities and the sharpness of the points are well shown.

may slide upward when traction is made, and if the intruder is rotated so as to bring the plane of corroded points to correspond with the sagittal diameter of the glottis it may come through. If such a foreign body is in the esophagus it must be rotated so that the plane of the points corresponds to the frontal plane of the body in order to come up between the cricoid cartilage and the cervical portion of the spine.[6]

6. Jackson, Chevalier: A Fence Staple in the Lung: A New Method of Bronchoscopic Removal, J. A. M. A. **64**:1906 (June 5) 1917.

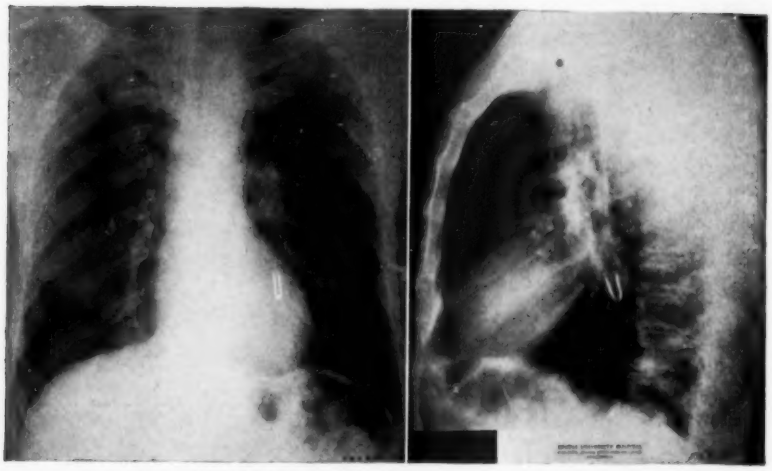


Fig. 11.—The length of a staple is shown in the anteroposterior projection, but in this roentgenogram the impression of the distance of separation of the points is deceptive. The equation of foreshortening as well as that of magnification must be determined by additional roentgenograms in working out a solution of the mechanical problem. The patient was a man aged 50. The sojourn of the foreign body was eleven weeks.

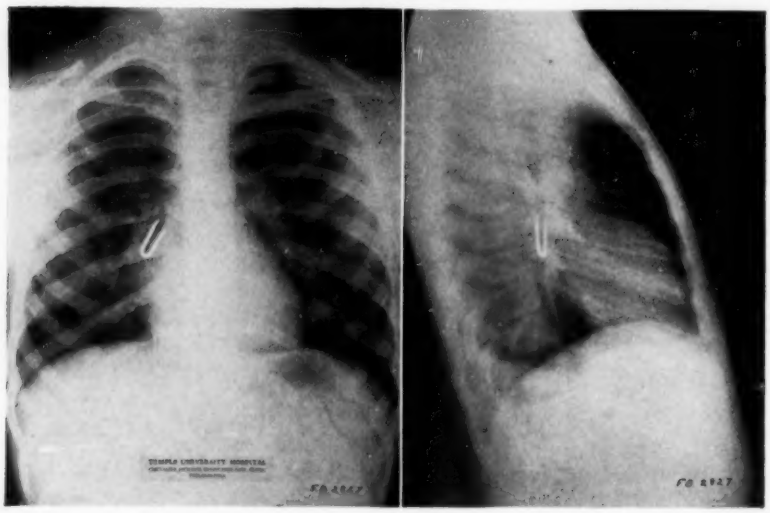


Fig. 12.—In this case the points are in a different relative plane from those in figure 11. In neither of the projections does the film show the maximum separation of the points. Another roentgenogram in the plane of maximum separation should be made. Of vital importance in removal is the proximity of the median point to the pericardium. The patient was a girl aged 9 years. The sojourn of the foreign body was one week.

Almost always, however, the points of staples and double-pointed tacks are sharp and rip into the bronchial wall in such a way as to prevent removal without either sheathing of the points or version of the foreign body.

Roentgen Examination.—Of first importance in the study of the mechanical problem of bronchoscopic extraction in a case of staple lodged in the tracheobronchial tree is the roentgen study. It will not do to go ahead with bronchoscopic removal on the basis merely of a fluoroscopic report that there is a staple in the lung. One must have roentgenograms in the anteroposterior and lateral projections and an additional one made in the plane necessary to demonstrate the greatest

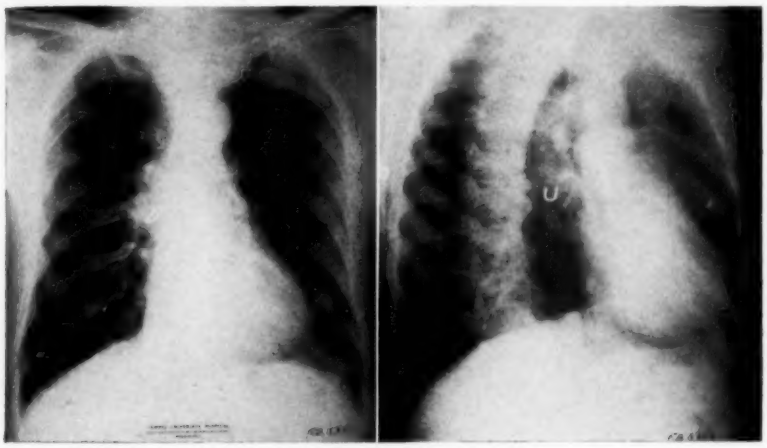


Fig. 13.—Anteroposterior and lateral roentgenograms of a man aged 57 showing a staple entirely within the bronchus of the middle lobe. Both roentgenograms show a foreshortened shadow; another projection was necessary to show the maximum separation and sharpness of the points, the divergence of the extremities and the full length of the staple, all of which was of vital importance in getting a proper conception of all the elements involved in the solution of the mechanical problem. The staple was removed by cephalic version in the plane of the extremities.

distance between the points; this is not only to show the spread of the staple but also to determine the position of its greater plane. Still another roentgenogram is necessary; it should be so made as to eliminate foreshortening, and thus determine the actual length of the staple (figs. 11, 12, 13 and 14). The roentgenologist must do four things: (1) make proper roentgenograms; (2) indicate whether the foreign body is of normal shape or is deformed; (3) indicate whether the points have lost their sharpness by corrosion, and (4) furnish an exact duplicate

of the foreign body in the lung, duplicating size, length, sharpness of the points and degree of divergence of the branches.[7]

Cephalic Version.—The extremities of the staple may be turned down and the foreign body delivered by the head if (*a*) the staple is no longer than the transverse diameter of the invaded bronchus or (*b*) if there are branch bronchial orifices into which the extremities can be guided. This method has been in successful use for twenty-five years.[8] The version may be in the plane of the extremities (fig. 7) or vertical to the plane of the extremities (fig. 8). The latter method is dangerous with long staples, that is, those the length of which greatly exceeds the diameter of the bronchus at the location of turning. The bifurcation of the trachea affords the greatest width of lumen for version; next

Fig. 14.—Neither of these roentgenograms is made in a plane to show the greatest separation of the points. A third film should be made in such a case so as to eliminate the equation of foreshortening in order to facilitate accurate matching of a duplicate for the use of the bronchoscopist in the working out of the mechanical problem. The patient was a man aged 77. The sojourn of the foreign body was nineteen days.

in width is the widening at the orifices of the bronchi of the upper and the middle lobe; lesser widenings are at the giving off of branch bronchi. In the hypopharynx the version may be done in situ. In the esophagus endogastric version is best. The foreign body is seized at the middle of the head with rotation forceps; it is then guided gently down into the stomach, where there is always plenty of room to turn it over without trauma.

7. Jackson, Chevalier, and Jackson, Chevalier L.: Foreign Body in Air and Food Passages, in Case, J. T.: Annals of Roentgenology, New York, Paul B. Hoeber, Inc., 1934, vol. 16.

8. Jackson, footnotes 3b and 6.

INSTRUMENTS

Sheathing forceps are practical if the staple is fixed; otherwise the staple will rotate so as to render accurate application difficult. Two cylindric forceps may also be used, one to sheathe each point separately.

The staple bronchoscope is the best of all means for solution of the problem. By this method both points are sheathed in the mouth of the tube of our special staple bronchoscope; removal of very large staples requires the pivoted form of this special bronchoscope. The bronchoscope is gently guided down over the points; the foreign body must not be pulled into the mouth of the tube because this would cause the points to penetrate the walls. In order to facilitate the sheathing the foreign body must be fixed with the special, broad-jawed forceps;

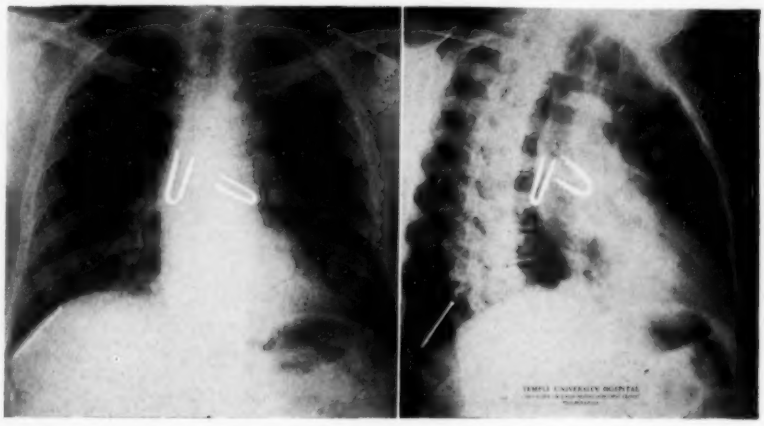


Fig. 15.—Roentgenogram of a man aged 56 showing two huge fence staples and a nail in the bronchi. In the anteroposterior projection the maximum separation of the points of the staple in the bronchus in the right lung is shown, but the shadow of the separation of the points of the staple in the bronchus in the left lung is deceptive. In the quartering roentgenogram the separation of the points of this staple is better shown, but it is not quite maximum, and the length is much foreshortened. The nail and the staple in the bronchial tree of the right lung were removed first by bronchoscopy, and the staple in the bronchus of the left lung in a second operation. Perfect recovery followed (case 3051 in the table).

this prevents rotation of the body. One caution is of vital importance: No traction should be made until both points are safely sheathed. In order to be certain that one point is not outside the mouth of the tube the work must be done in the fluoroscopic room so that at this critical point one may make doubly certain as to this point by fluoroscopic observation. The fluoroscopist must be impressed concerning the vital necessity for absolute certainty. The biplane fluoroscope is necessary for this work; the ordinary fluoroscope may be fatally misleading.

Cases of Double-Pointed Objects in the Bronchi, Esophagus and Stomach Removed by the Oral Route

Case Number and Illustration	Age and Sex	Foreign Body	Location and Sojourn	Anesthetic	Tube	Problem	Forceps	Point of Seizure	Result	Time	Comment
Fbdy. 236	4 yr.	Staple: double-pointed	Trachea at the aortic level with the points up	None	5 mm. by 35 cm. broncho-scope	Transfixed obliquely, points buried; lacerated postero-lateral wall; medi-astinal emphysema; moribund condition of patient on admis-sion due to previous injudicious traction	Rotation	Head after version	Extraction; cure; vagitis uninfluenced	.....	Died of vagitis
Fbdy. 237	19 mo.	Staple: double-pointed	Stem of the bronchus of the right lung with the points up	None	5 mm. by 35 cm. broncho-scope	Points upward, fit-ting tightly; one point embedded in swollen mucosa; cephalic version, ver-tical to the plane of the extremities	Rotation	Head after version with hook	Extraction; cure	½ hr.	Foreign body coaxed up and turned at the orifice of the bronchus of the mid-dle lobe after the buried point was freed
Fbdy. 238	10 yr.	Staple: double-pointed	Tracheal bifurcation, with the points up	None	5 mm. by 40 cm. broncho-scope	Points obliquely upward; cephalic version in the plane of the extremities	Rotation	Curve after turning	Extraction; cure	50 min.	Foreign body turned at the tracheal bifurcation
	16 yr.	Staple: double-pointed	Esophagus, below the plica crico-pharyngeus	None	8 mm. by 40 cm. esophago-scope	Points upward, not embedded; endo-gastric version	Rotation	Curve	Extraction; cure	.....	Foreign body carried into the stomach, reversed and removed
	44 yr.	Staple: double-pointed	Posterior branch of the bronchus of the inferior lobe of the	Local	7 mm. by 45 cm. broncho-scope	Points upward, buried; proximal edema; cephalic version in the plane of the	Side-curved; hooks	Head after version	Extraction; cure	1 hr. 24 min.	Localized inflammation resulting from puncture of the mucosa by the points; proximal annular edema present

Fbdy. 399	44 yr.	Staple: double-pointed	Posterior branch of the bronchus of the inferior lobe of the right lung for 15 days	Local	7 mm. by 45 cm. broncho-scope	Points upward, buried; proximal edema; cephalic version in the plane of the extremities	Side-curved; hooks	Head after version	Extraction; cure	1 hr. 24 min.	Localized inflammation resulting from puncture of the mucosa by the points; proximal annular edema present
Fbdy. 409	43 yr.	Staple: double-pointed	Main bronchus of the left lung for 2 years	Local	9 mm. by 40 cm. broncho-scope	Points upward, sharp and buried; large size	Side-curved; hooks	Head after version	Extraction; cure	1 hr. 20 min.	Granulations noted with fibrous narrowing of the lumen proximally and foul pus; no trauma from the bronchoscopy performed before admission; staple removed by cephalic version in the plane of the extremities
Fbdy. 634	4 yr. M	Staple: double-pointed	Main bronchus of left lung for 25 days	None	5 mm. by 30 cm. broncho-scope	Sharp points up in a small bronchus swollen shut; points invisible and buried in the bronchial wall adjoining the pulmonary vein	Rotation	Curved end after turning (cephalic version with pointed extremities turned downward, changed to head presentation for withdrawal)	Extraction; cure	18 min. 9 sec.	Bronchus swollen almost shut, proximally
Fbdy. 690	53 yr. M	Staple: double-pointed	Bronchus of the inferior lobe of the right lung for 11 days	Local	8 mm. by 40 cm. broncho-scope	Sharp points upward	Side-curved	One point, the other point protected by the lip of the mouth of the tube	Extraction; cure	41 sec.	Moderate localized bronchitis and streaks of scratches corresponding to movement of the points during respiration and cough; neither point hidden; no signs of trauma

Cases of Double-Pointed Objects in the Bronchi, Esophagus and Stomach Removed by the Oral Route—Continued

Case Number and Illustration	Age and Sex	Foreign Body	Location and Sojourn	Anesthetic	Tube	Problem	Forceps	Point of Seizure	Result	Time	Comment
Fbdy. 825	4 yr. F	Staple: double-pointed	Trachea for 5 days	None	Laryngoscope	Points upward, buried in tissue below glottic narrowing; rigid wire; sharp points; danger of foreign body dropping deeper	Rotation	Head	Extraction; cure	1 min. 35 sec.	Points buried in the swollen subglottic tissues; the posterior point readily seized and advanced up out of the larynx, the anterior point being induced to trail downward as the curved portion was brought upward; the curved portion then forced posteriorly against the membranous wall of the trachea and caused to emerge by pressure exerted in a posterior direction by the spatular tip of the laryngoscope
Fbdy. 975	7 yr. M	Staple: double-pointed	Stem of the bronchus of the right lung for 26 days	None	5 mm. by 35 cm. bronchoscope	Points upward; pathologic process and trauma; cephalic version in the plane of the extremities	Rotation	Head; version of points at the orifice of the bronchus of the upper lobe	Extraction; cure	39 min. 42 sec.	The foreign body found just below the orifice of the bronchus of the upper lobe; was turned at the level of the bronchus of the upper lobe and removed
Fbdy. 664	48 yr. F	Carpet tack	Bronchus of the left lung for 5 months	Local	9 mm. by 40 cm. bronchoscope	Points upward; buried in swollen mucosa	Side-curved	Head end after cephalic version; vertical (presenting extremities turned downward)	Extraction; cure	2 min. 37 sec.	The internal point buried in the bronchial wall, and the external point hidden by granulation tissue; localized bronchitis present but the pathologic change slight considering the length of sojourn
Fbdy. 1250	8 yr. M	Staple; double-pointed	Main bronchus of the left lung for 6 years	None	6 mm. by 35 cm. bronchoscope	Points upward; very sharp but crumbling	Rotation	Head, after version	Extraction; cure	18 min. 42 sec.	The history ignored: the patient treated for diphtheria, then for chronic bronchitis; roentgen examination after 6 years revealed the foreign body; bronchoscopic examination revealed the bronchus inflamed and blocked with granulations just above the orifice of the bronchus of the upper lobe; large quantities of pus aspirated; the staple seized with a rotation forceps and turned in an abscess cavity in the lower lobe with the [illegible]
			about 2 cm. below the bronchus of the upper lobe for								bronchial walls, leaving a lumen of stricture less in the transverse diameter than in the anteroposterior; the bronchoscope insinuated into the lumen of the strip-

Fbdy. 1243											
			about 2 cm. below the bronchus of the upper lobe for 15 years								
Fbdy. 1393											lumen of stricture less in the transverse diameter than in the anteroposterior; the bronchoscope insinuated into the lumen of the stricture and both points brought into the mouth of the tube thus permitting removal of the sheathed staple without trauma to the bronchus
Fbdy. 1440	2 yr. M	Staple: double-pointed	Stem of the bronchus of the lower lobe of the right lung for 8 weeks	None	4 by 6 mm. by 30 cm. staple broncho-scope	Impaction in relatively small bronchus with points buried upward	Broad, flat, staple	Both points in distal mouth of the tube	Extraction; cure	6 min. 50 sec.	A satisfactory solution of a difficult problem by the use of the special staple bronchoscope
Fbdy. 1581	4½ yr. F	Staple: double-pointed	Bronchus of the left lung for 2 years 10 months	None	2 by 5 mm. by 30 cm. staple broncho-scope	In mass of pathologic tissue due to prolonged sojourn; problem of sheathing points	Broad, flat, staple	Points flatwise	Extraction; cure	18 min. 45 sec.	The staple bronchoscope very satisfactory
Fbdy. 2034	14 yr. M	Staple: double-pointed	Bronchus of the lower lobe of the left lung for 7 years	None	4 by 6 mm. by 30 cm. staple broncho-scope	Covering both points of staple	Broad staple	Both points	Extraction; cure	20 min. 28 sec.	Proximal annular stenosis caused by a seven year sojourn with the lumen too small to bring the staple through; dilation of the stricture by means of the tip of the bronchoscope
Fbdy. 2778	50 yr. M	Staple: double-pointed	Bronchus of the lower lobe of the left lung for approximately 11 weeks	None	4 by 10 mm. by 40 cm. staple broncho-scope	Points upward, buried in bronchial walls; cephalic version in the plane of the extremities	Broad staple first; rotation forceps second	By the point, then by the head for version	Extraction; cure	32 min. 50 sec.	

Cases of Double-Pointed Objects in the Bronchi, Esophagus and Stomach Removed by the Oral Route—Continued

Case Number and Illustration	Age and Sex	Foreign Body	Location and Sojourn	Anesthetic	Tube	Problem	Forceps	Point of Seizure	Result	Time	Comment
Fbdy. 2827	9 yr. F	Staple: double-pointed	Bronchus of the lower lobe of the right lung for about 1 week	None	5 mm. by 35 cm. broncho-scope	Lodged points upward in a bronchus too small to hold the staple without burial of the points in tissue; cephalic version vertical to the plane of the extremities	Rotation	By the head after version	Extraction; cure	39 min. 8 sec.	
Fdby. 2829	57 yr. M	Staple: double-pointed, medium size	Within the bronchus of the middle lobe for 4 days	None	8 mm. by 40 cm. broncho-scope	Two very sharp points; lateral cephalic version in the plane of the extremities	Rotation	By one branch close to the head for version, then by the middle of the head	Extraction; cure	6 min. 13 sec.	
Fbdy. 2840	77 yr. M	Staple: double-pointed	Posterior branch of the bronchus of the lower lobe of the right lung for 10 days	None	4 mm. by 45 cm. staple broncho-scope	Deeply embedded in a bronchus "on the stretch"; with tendency of both very sharp points to penetrate the bronchial wall	Broad flat staple forceps	Both pointed extremities at once	Extraction; cure	27 min. 35 sec.	Point-sheathing method with special staple bronchoscope
Fbdy. 2944	17 yr. M	Staple: double-pointed (largest size)	Bronchus of the left lung with the head resting on the spur between the bronchi of the upper and the lower lobes, with lowermost point buried in the median wall of the bronchus below the carina for 2 years	None	4 by 16 mm. by 40 cm. expanding staple broncho-scope	Widely spread divergent points with the lower point buried for about 1 cm. in the median wall of the bronchus in the third interannular membrane below the carina; the greatest difficulty was in disembedding lower point; the staple rotated in the greater plane and delivered by the head (cephalic version); the advancing point made an arc through the widest part of the tracheobronchial tree at the bifurcation, the lower limb of the arc cutting in the staple	Rotation	First, one branch, then, by the head of the staple	Extraction; cure	35 min. 40 sec.	The staple embedded in fungating bleeding tissue and bathed in pus as a result of the long sojourn

Fbdy. 2944			carina for 2 years			widest part of the tracheobronchial tree at the bifurcation, the lower limb of the arc					
Fbdy. 3051	56 yr. M	Fence staple: double-pointed (large size)	Stem of the bronchus of the right lung with the external point engaged in the upper wall of the bronchus	None	4 by 16 mm. by 40 cm. expanding staple broncho-scope	Sharply pointed, with one point deeply buried in the bronchial wall	Flat, staple and rotation forceps	Rounded end	Extraction of staple and nail	.....	The greatest difficulty from the fact that the staple was so widely spread at the points with a greater spread than the transverse diameter of the bronchus invaded, thus forcing the point into the bronchial wall; the staple was moved up into the trachea, then was tilted slightly sidewise, with one point so placed that it would not rip into the tissues and the other point sheathed in the lip of the mouth of the tube; difficulty encountered in getting the staple through the glottis because of the great spread of the points, the spread being greater than the sagittal diameter of the larynx; it was manipulated through the glottis; one of the staples and the nail removed, no attempt being made to remove the the second staple
		Nail	Bronchus of the lower lobe of the right lung 5 mm. from the diaphragm at the nearest point for about 3 months	.....	4 mm. by 45 cm. costo-phrenic broncho-scope	Large nail at the periphery of the lung; pathologic change from a sojourn of 3 months; disengaging head from pathologic tissue	Forward-grasping	Head			
		Fence staple (large size)	Bronchus of the left lung with the head at the orifice of the bronchus of the upper lobe for about 5 months	None	4 by 20 mm. by 40 cm. bivalve broncho-scope	Points upward, with one buried below the carina in median wall of the bronchus; problem complicated by the bad angle of approach, with the axis of the staple almost horizontal	Ring, rotation and flat forceps	Both branches after release of the distal point	Extraction of remaining staple; cure	25 min. 26 sec.	Two staples and a nail in the bronchi of the same patient at the same time is unique in the literature of bronchoscopy
Fbdy. 834	9 mo. F	Bent wire	Hypo-pharynx, behind the cricoid cartilage curving through the pyriform sinus for 3 days	None	Laryngo-scope	None; wire fine, very soft and malleable (annealed)	Laryngeal	Near one end	Extraction; cure	2 min. 40 sec.	

Cases of Double-Pointed Objects in the Bronchi, Esophagus and Stomach Removed by the Oral Route—Continued

Case Number and Illustration	Age and Sex	Foreign Body	Location and Sojourn	Anesthetic	Tube	Problem	Forceps	Point of Seizure	Result	Time	Comment
Fbdy. 837	2 mo. F	Hairpin	Hypopharynx and orifice of the esophagus for about 1 month	None	7 mm. by 30 cm. esophagoscope	Both points upward and buried in mucosa	Side-curved	One point after the other point was bent inward	Extraction; cure	1 min. 56 sec.	The child was examined by roentgenogram on the suspicion of an enlarged thymus because of stridulous respiration of one month's duration
Fbdy. 1472	8 yr. M	Metallic object from toy radio set shaped like a staple	Bronchus of the lower lobe of the left lung for 5 months	None	Staple bronchoscope	Widely spread, sharp upward points buried in tissue	Approximation	Pointed ends after approximation	Extraction; cure	35 min. 40 sec.	Localized suppurative process
Fbdy. 1582	12 yr. M	Tonsil wire (and blood clots)	Bronchus of the right lung for 1 day	None	5 mm. by 35 cm. bronchoscope	Stiff spring-steel wire hooked into a small branch of the bronchial orifice; wire doubled into the tube	Side-curved	Right	Extraction; cure	19 min. 53 sec.	The absence of inflammation of the bronchial mucosa noteworthy; the foreign body aspirated during a tonsillectomy; firm blood clots found in both main bronchi, probably inspirated during the operation; blood clots aspirated

1773
Fbdy. 1773

3½ yr. F	Curved wire	Esophagus for 10 days	None	7 mm. by 30 cm. esophagoscope	Widely spread upward-projecting points of heavy wire	Very heavy approximation (special)	By both branches near the end	Extraction; cure	7 min. 30 sec.	About the limit of possibilities in approximation of heavy, very stiff wire

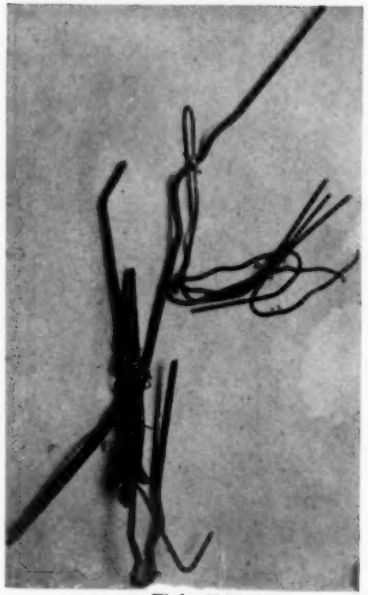
Fbdy. 1924

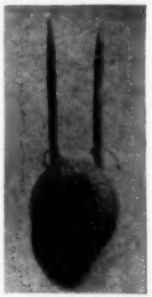
11 yr. M	Metallic fastener	Bronchus of the lower lobe of the left lung for 3½ years	None	4 mm. by 35 cm. costophrenic bronchoscope	Double-pointed, with points upward and embedded in tissue	Side-curved	Anterior prong	Extraction; cure	10 min. 20 sec.	The body much corroded from the long sojourn; points approximated for removal

Fbdy. 1939

49 yr. F	Cluster of hairpins	Esophagus below the plica cricopharyngeus for 2 days	None	10 mm. by 30 cm. esophagoscope	Sheathing of three upward-projecting points	Side-curved and ratchet rotation	One point with other points held in the mouth of the tube with rotation forceps	Extraction; cure	12 min. 20 sec.	Extraction difficult but managed without trauma; one point covered with the forceps, and two points sheathed in the mouth of the tube

Cases of Double-Pointed Objects in the Bronchi, Esophagus and Stomach Removed by the Oral Route—Continued

Case Number and Illustration	Age and Sex	Foreign Body	Location and Sojourn	Anesthetic	Tube	Problem	Forceps	Point of Seizure	Result	Time	Comment
 Fbdy. 1943	49 yr. F	Burr of entangled and fastened hairpins	Stomach for 2 weeks	None	10 mm. by 53 cm. gastroscope	Bristling points dangerous to remove en masse; the burr unfastened and disentangled with forceps and the mouth of the gastroscopic tube in the stomach, then withdrawn through the gastroscope	Rotation	Bights	Extraction; cure	Estimated 8 min.	
Fbdy. 2503	8 mo. M	Wire bassinet fastener	Esophagus for 23 days	None	Esophageal speculum	Two points penetrated, with one resisting upward and the other, downward movement	Laryngeal grasping	Shaft of upwardly directed portion of the wire after disengagement; the point was rotated so that the axis of this portion corresponded to the long axis of the esophagoscope; the latter was then pushed downward so as to sheathe	Extraction; cure	2 min. 22 sec.	This foreign body particularly dangerous for traction; and exemplified the necessity for the rule never to pull up on a pointed foreign body without sheathing the point; massive subcutaneous emphysema on admission from injudicious traction before admission

 Fbdy. 2524	10 yr. F	Double-pointed pin-button of an upholstery cover	Bronchus of the right lung with the head in the bronchus of the lower lobe for 17 days	None	6 mm. by 40 cm. broncho-scope	One branch perforated the bronchial wall; the subjacent bronchus too small to permit pushing downward	Approximation	By both points	Extraction; cure	9 min. 11 sec.	Approximation of the pointed branches relatively easy if not for one point completely buried in the bronchial wall; release of buried branch not possible by pushing downward but by rotation; potentially a dangerous case
Fbdy. 2663	18 yr. F	Hairpin	Bronchus of the lower lobe of the right lung for about 13 years	None	4 mm. by 45 cm. broncho-scope	A fine wire in a mass of pathologic tissue; wire friable from corrosion	Forward-grasping	By one end	Extraction; cure	10 min. 7 sec.	

EFFECT OF EXPERIMENTAL BILATERAL TURBINECTOMY ON THE DEVELOPMENT OF THE TESTES IN THE RABBIT

PAUL R. NEMOURS, M.D.
ST. LOUIS

The reports of various investigators working in both the clinic and the laboratory have definitely established the fact that the nose and related structures bear a significant relationship to the body as a whole. It has been determined in the laboratory that the carbon dioxide-carrying capacity of the blood is greater in a patient who breathes through his nose than in one who breathes through a tracheotomy tube.[1] It was found that the passage of air through the nose stimulates the sensory endings of the fifth nerve, thereby reflexly stimulating the vagus nerve, which results in an increased expansion of the chest. If one side of the nose is blocked the same side of the chest does not expand as fully as the other side. In a person who breathes through the mouth the blood is not oxygenated as much as in one who breathes through the nose, and the carbon dioxide-combining power of the blood is lower. This is explained as being due to the elimination of the nasothoracic reflex.[2] It is of interest to note that Wenner has found that the injection of carbon dioxide into the maxillary sinus of a rabbit breathing through a tracheal cannula causes a greater stimulus to respiration than the injection of air.[3] Jung and Chavanne found that several months after castration adult dogs do not have as great a secretion of nasal mucus as before castration when 5 mg. of pilocarpine hydrochloride is injected.[4]

Fliess [5] and others have reported the disappearance of the pains of dysmenorrhea on cocainization of certain areas of the nose. Recently Crossen [6] also reported success with this procedure in a small series of

From the Department of Otolaryngology, Oscar Johnson Institute, Washington University.

1. Kreewinsch, P.: The Lactic Acid of the Blood in Experimental and Pathological Mouth Breathing, Acta oto-laryng. **17**:48, 1932; The Alkali Reserve in Cases of Nasal Obstruction and in Hyperplasia of the Tonsils, ibid. **14**:90, 1930.

2. Sercer, A.: Investigations on the Reflex Influences of the Nasal Cavity on the Lung on the Same Side, Acta oto-laryng. **14**:82, 1930.

3. Wenner, W. F.: Personal communication to the author.

4. Jung, L., and Chavanne, F.: Nasal Secretion Following Castration, Oto-rhino-laryng. internat. **18**:481, 1934.

5. Fliess: Zentralbl. f. Gynäk. **31**:981, 1908.

6. Crossen, H. S., and Crossen, R. S.: Diseases of Women, ed. 7, St. Louis, C. V. Mosby Company, 1930.

cases. Conditions such as impotence following resection of the lateral wall of the nose, relief of sterility following cure of a nasal disturbance and disappearance of secondary sexual characteristics after a bilateral pathologic process in the nose have been grouped in a report of Karpow [7] as disturbances in the genital zone caused by changes in the nose. In a second group he listed changes that have been found in the nose following changes in the genital organs. They were anosmia following removal of a uterine myoma, stuffy nose and sneezing in a patient who was cured after gynecological treatment and nasal hemorrhage following excitement of the sexual organs, for example in coitus, or an operation on the urogenital system. In a third group he listed vicarious dysfunctions of the nose due to disturbances of the genital organs, such as periodic nasal bleeding with amenorrhea, vicarious nasal hemorrhage with marked development of the sex organs and lack of vicarious hemorrhages in castrated women. The aforementioned reports seem to indicate that the nose and related structures bear a significant relationship to the body as a whole.

The report of Karpow on the effect of bilateral maxillary turbinectomy on the development of the testes in the rabbit is as mysterious as it is interesting. He removed the turbinate on one side of a rabbit from 5 to 6 weeks old and ten days later removed the turbinate on the other side. His approach to the turbinate was by means of a dorsal slit made in the nose. In the control animals at the end of thirty-nine weeks the combined weight of the testes, which had descended in the usual time to the scrotum, was 2.3 Gm. In the experimental animals, in which the testes did not descend, the combined weight was about 1.2 Gm. The internal organs did not show marked change. The body weight of the animals on which the operation was performed was less than the weight of control animals of similar age. The sexual organs of both the male and the female animals of the former group weighed less than those of the controls. No microscopic observations were reported.

TECHNIC AND OBSERVATIONS

In this work the experiment performed by Karpow was repeated. Female rabbits were not used because the ovary is well developed at birth. Normal male rabbits from 4 to 5 weeks old were operated on on one side under ether anesthesia; a dorsal slit was made, and the nasofrontal bone was turned laterally. The maxillary turbinate was removed with a scalpel, and the insertion was cauterized with an electric cautery. The bone was then replaced, and the skin was sutured. In ten days the opposite side was treated in the same manner. Several rabbits were operated on without removal of the turbinates in order to determine if mere surgical procedure in the nasal region would have any effect. In the rabbits that

7. Karpow, N.: Zur Frage des Zusammenhangs der Nase mit der Sexualsphäre, Monatschr. f. Ohrenh. **63**:758, 1929.

were cauterized the mortality was so high that cauterization was dispensed with, and more rabbits survived. Weekly records of weight were kept, and autopsy was performed when the animals were 6 months of age.

In normal male rabbits, according to Dorn and Sugarman [8] there is a definite relationship between descent of the testes and spermatogenesis. The testes are abdominal organs until the rabbit is about 3 months of age. They then come down into the inguinal ring and descend into the scrotum in a migration period lasting from ten days to two weeks. Spermatogenesis is not fully developed until the testes reach the scrotum.

Of a series of seven male rabbits on which turbinectomy was performed and which survived to 6 months of age, five developed normally, and the testes descended to the scrotum in the usual manner. In two rabbits the testes did not descend. The average body weight at 6 months of age of the controls and of the normally developing rabbits on which turbinectomy was performed was between 2.5 and 3 Kg. The weight of the testes averaged about 5 Gm., and all the testes had a normal histologic structure, showing normal spermatogenesis. Of the two

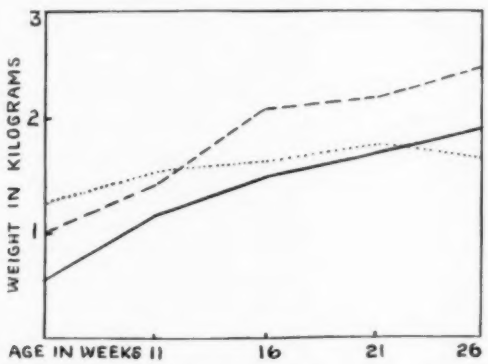


Fig. 1.—Weight of the experimental and control animals according to age. The line of dashes represents the control group; the solid line, the group on which turbinectomy with cautery was performed, and the line of dots, those on which turbinectomy alone was performed.

rabbits in which the testes failed to descend, the one in which cautery was used at the end of six months weighed 1.92 Kg., and the testes weighed 0.392 Gm. The other rabbit in which cautery was not used weighed 1.7 Kg. (fig. 1). The testes of this rabbit weighed 1.47 Gm.

No significant change in weight was found for the pituitary glands, for those for both the control and the experimental group averaged about 0.03 Gm. in weight. No significant change was found in the internal organs other than the sex organs. The noses of the animals on which turbinectomy was performed showed a lack of the usual development, there being only a narrow slit on each side just adequate for the passage of air. The animals operated on without removal of the turbinates, that is, those in which a dummy operation was performed, developed similarly to the control animals. This would indicate that mere surgical procedure in the nasal region has no specific effect.

8. Dorn, J. H., and Sugarman, E. I.: A Method for the Prediction of Sex in the Unborn, J. A. M. A. **99**:1659 (Nov. 12) 1932.

The histologic observations on the testes which did not descend proved to be of great interest. Figure 2 shows a section from a testis of a rabbit on which turbinectomy was performed with cautery. It can be seen that spermatogenesis did not go beyond the spermatocyte stage, at which time degenerative changes took place. Many pyknotic nuclei can be seen.

Microscopic studies were made of the pituitary glands, but so-called castration cells were not found. These are large peculiar clear cells found in the anterior lobe of the pituitary gland and are derived from the basophil cells. Biedl [9] first described these cells in castrated albino rats. The literature is not in agreement generally on reported findings in the anterior lobe of the pituitary gland in other species. It is of interest to note that Biggart [10] reported vacuolation and colloid formation in the basophil cells in the anterior lobe of the pituitary gland of several persons who were castrated. The relation of the pituitary gland to descent of the

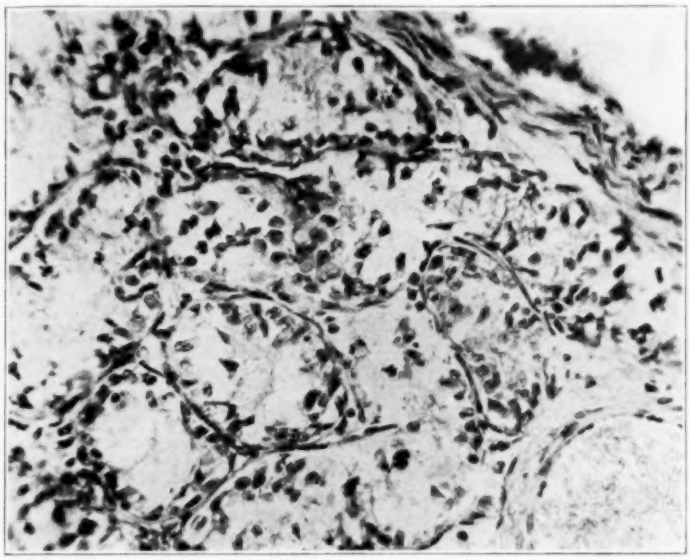


Fig. 2.—Photomicrograph of a section of the testis of a rabbit on which turbinectomy with cautery had been performed. There is no evidence of spermatogenesis beyond the spermatocyte stage. Pyknotic nuclei can be seen. Magnification, × 900.

testes seems to be of great importance. Sexton [11] reported a series of cases of cryptorchidism in which descent of the testes to the scrotum followed the administration of an anterior pituitary-like hormone.

9. Biedl, A.: Internal Secretory Organs, London, John Bale, Sons & Danielsson, Ltd., 1912.

10. Biggart, J. H.: The Hypophysis of the Human Castrate, Bull. Johns Hopkins Hosp. **54**:157, 1934.

11. Sexton, D. L.: Treatment of Sexual Under-Development in the Human Male with the Anterior Pituitary-Like Hormone of Urine of Pregnancy, Endocrinology **18**:47, 1934.

The failure of the descent of the testes, as can be seen, may be explained by both specific and nonspecific factors or by a combination of the two. An explanation of the results obtained is not feasible at this time and would go beyond the present knowledge and the scope of this investigation. It has been shown that removal of the turbinates interferes with the normal sexual development of some rabbits. The work confirms Karpow's report, and, in addition, histologic evidence is given. To determine the exact relationship of the nose and sexual organs will require the combined efforts of biologists, physiologists and biochemists. It is hoped that this report will demonstrate the possibilities of the relationship between the nose and the sexual organs and will stimulate further work in this field.

CONCLUSION

Removal of the maxillary turbinates of young rabbits will cause lack of development and spermatogenesis in the testes in some instances.

Clinical Notes

DERMOID CYST OF THE TONSIL

MILTON M. ROSENBERG, M.D., SCRANTON, PA.

Dermoids occur commonly and have been found in numerous localities in the body. The most frequent locations are about the orbit, neck and coccygeal region, where different germinal layers meet during development. Dermoids are also found in the subcutaneous tissue, ovaries, mediastinum, skull, pia mater, optic nerve, eyelid, cornea, face, nose, tongue and pharynx. Included in the foregoing list should be the rare sites. One of these is the mesentery (Montgomery and Morest [1] reported eight cases), and a second is the tonsil, where only three cases, including the present one, have been reported.

Henrot [2] in 1880 reported the removal of a tumor from the palatine arch but considered it to be a sebaceous cyst, though he realized that there are "no sebaceous glands in the mucosa of the palate under normal conditions." A histologic

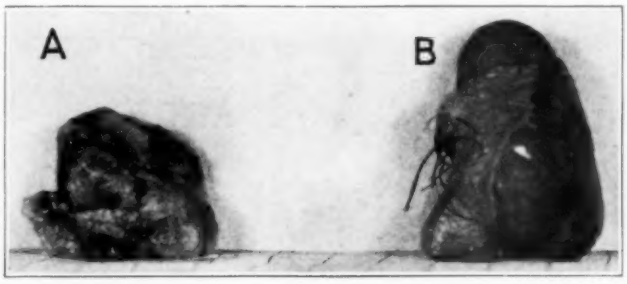


Fig. 1.—*A* shows the left tonsil, and *B*, the cystic right tonsil with hair.

report did not accompany the article. White [3] in 1881 removed a tumor from the palatal region of a child of 3 years; the tumor grew from behind the uvula. He thought the tumor had its origin in connection with the eustachian tube. Augier and Levrand [4] in 1903 reported a case of true dermoid of the tonsil in a child of 3½ months. The tumor was implanted in the supratonsillar lobe. The pathologic examination revealed the characteristics of a true dermoid cyst.

Riqueborg [5] in 1932 reported a similar tumor which arose from the right anterior pillar, but the question arises as to its being a sebaceous cyst, for on removal and incision of the membrane an abundance of "suet and débris of tissue which were recognized as epithelial concretions" was freed. Riqueborg's article included a reference to Jourdain (1778) in the *Journal de médicine*, but Jourdain's article refers to cases of ulcer, scrofula and syphilis. Riqueborg also quoted Dubosc; i. e., his reference was to the thesis of Dubosc, who in turn quoted Parmentier,[6]

1. Montgomery, J. G., and Morest, F. S.: J. Missouri M. A. **31**:456 (Dec.) 1934.
2. Henrot, A.: Union méd. et sc. du nord-est **4**:207, 1880.
3. White, Hale: Brit. M. J. **1**:597, 1881.
4. Augier and Levrand: J. de sc. méd. de Lille **1**:457, 1903.
5. Riqueborg, A.: Rev. Asoc. méd. argent. **45**:1493, 1932.
6. Parmentier: Gaz. de méd. **2**:347, 1856.

who reported cases of abscesses. "These abscesses often appear without any very appreciable cause . . . have been observed following extraction of a tooth . . . or puncture of the palate by a fish bone."

REPORT OF A CASE

A. L., an unmarried man aged 27, complained of difficulty in breathing through the nose, cough, difficulty in swallowing and vomiting. He was admitted to the outpatient department of the Scranton State Hospital in the department for

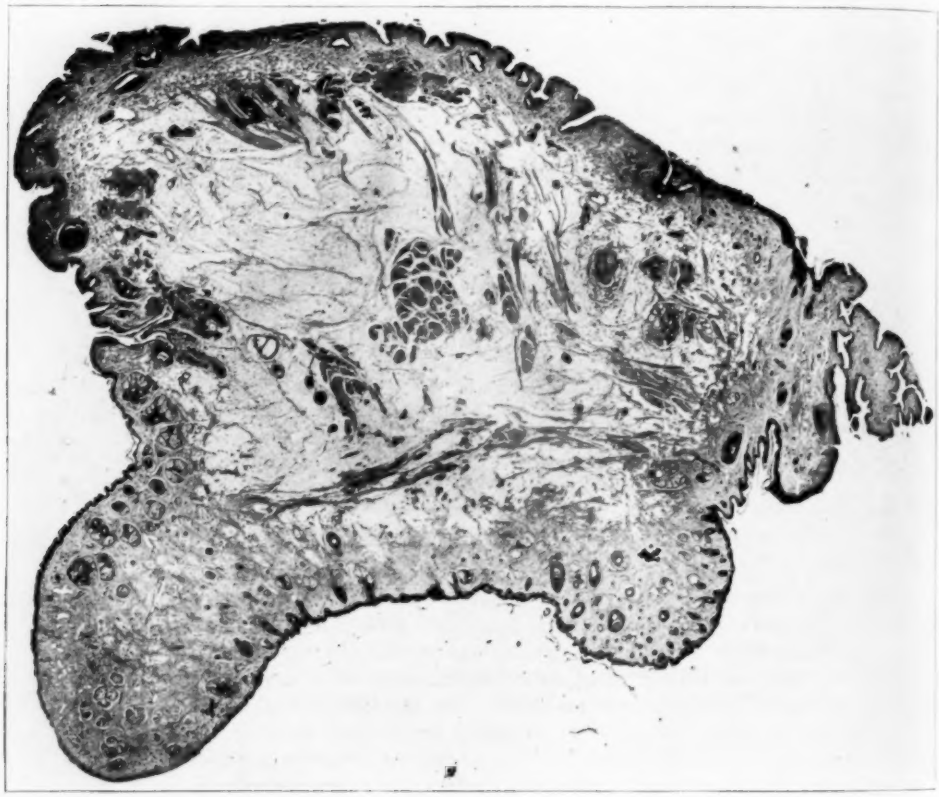


Fig. 2.—A section of the right tonsil, in the lower sixth of which hair follicles can be seen easily. Along the left border many sebaceous glands can be seen. In the central portion striped muscle is evident.

diseases of the nose and throat. The condition began three years before, when the patient felt fulness in the throat and difficulty in breathing on lying down. This was accompanied by cough, caused by tickling in the back of the throat. This continued to annoy the patient to such an extent that he looked into his mouth with a mirror and found a "lump" in the back of his throat.

About a month previous to the patient's admission to the outpatient department, while he was being examined for a position on the railroad, the mass was noticed, and as he complained of a cough a few hairs were removed from the mass, which lessened the cough. The mass was not removed.

General examination yielded negative results except in the throat. A mass was lying in the pharynx with numerous hairs protruding. The mass was attached to the tonsil (supratonsillar lobe) and not to the pharynx.

The patient was admitted to the hospital and the tonsils and the mass were enucleated under local anesthesia without much bleeding. The right tonsil was enucleated in three pieces.

Macroscopically the mass included the enlarged tonsil, which was approximately three times the size of the left tonsil and from which protruded long hairs, some of which were an inch (2.5 cm.) in length. The mass of tissue measured 35 by

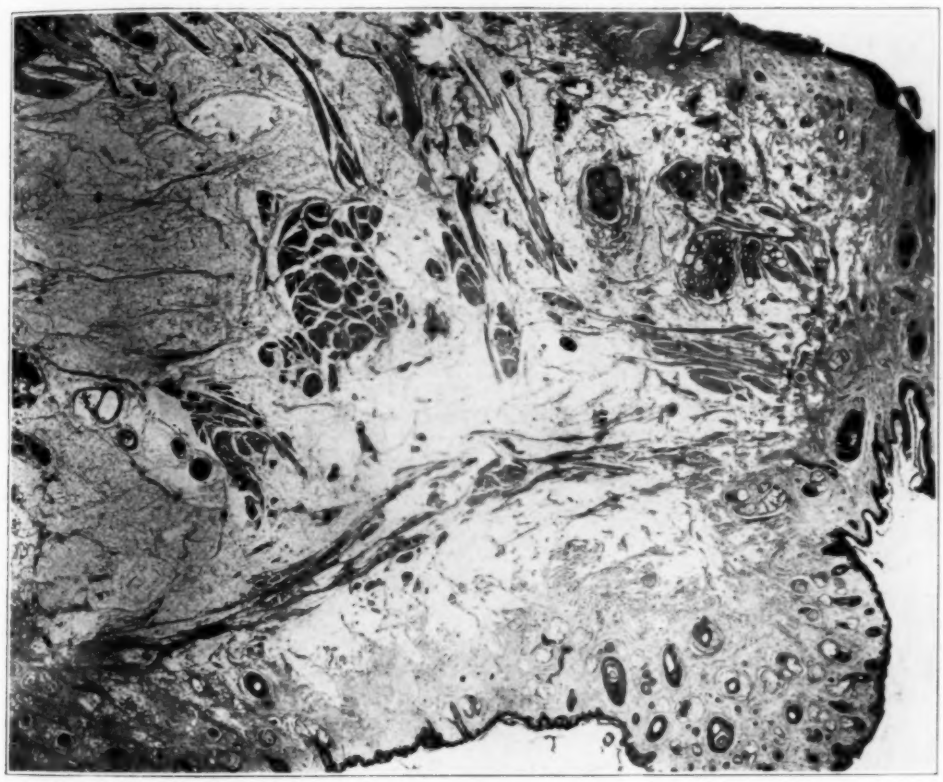


Fig. 3.—A section of the right tonsil, in the lower right corner of which the hair follicles show up distinctly. In the upper right corner glandlike structures can be seen.

25 mm. and weighed 7.3 Gm. The surface was smooth, except for one area, which showed a growth of hair.

Microscopically a section of the right tonsil showed a considerable number of mucous glands. The epithelium was thickened and of the squamous type. It showed the presence of hair and sebaceous glands. The crypts in this area were ulcerated.

The diagnosis was dermoid of the right tonsil.

Examination of the patient four months later revealed a normal throat with no recurrence.

510 Medical Arts Building.

MODIFICATION OF THE JACKSON BRONCHOSCOPE TO PERMIT RETROGRADE INSPECTION OF THE BRONCHI OF THE UPPER LOBES

FERNAND VISTREICH, M.D., NEW YORK

The importance of bronchoscopy for the removal of foreign bodies or the aspiration of secretions is well established, as is its recognition as a vital diagnostic procedure. The difficulty of thorough inspection of the bronchi of the upper lobes remains, however, a serious handicap.

The removal of foreign bodies or of anything which obeys the law of gravity rarely requires inspection of the bronchi of the upper lobes; however, internists and surgeons who are concerned with the diagnosis and treatment of pulmonary pathologic processes can ill afford to dispense with information about them. The bronchoscopist is therefore called on for a report on the entire tracheobronchial tree including the bronchi of the upper lobes, for they, as well as the bronchi of the middle and lower lobes, may be the site of malignant growth or of manifestations which might be of diagnostic significance.

Fig. 1.—The distal end of the bronchoscope, showing the mirror in the middle position.

There is known to me at present no device which solves the problem of retrovision of the bronchi of the upper lobes in bronchoscopy, although the need for such inspection is obvious and is too generally felt to require further elucidation. Inspired by this need I have modified the Jackson bronchoscope to permit retrovision from the tip of the instrument.

The modification consists of a small mirror fitted into the tip of the bronchoscope in such a manner that it can be brought into any angle desired and can be manipulated from the collar of the bronchoscope. The tip of the tube is cut so as to form not a lip, as in the ordinary bronchoscope, but a double V, with the apex of each V pointing distally. This is accomplished by cutting a V out of either side of the tube, with the bases of the V's meeting. Short arms attached to the apex of the V's hold the mirror in a side position and also act as an axis on which the mirror may rotate. A steel wire rod is hinged to one free edge of the mirror and is led through a canal in the tube to the collar of the bronchoscope, where it is connected with a screw in such a way that a turn of the screw moves the rod to or fro to change the inclination of the mirror. The mirror is sufficiently large to reflect the entire image of the bronchial opening of the upper lobe.

From the Department of Surgery (Subdepartment of Otolaryngology) of the New York Hospital and Cornell Medical College.

Neither the instrument nor its use is complicated. Its introduction is little different from that of the unmodified Jackson bronchoscope. The mirror may be kept parallel to the side of the tube or may be deflected to an angle in which there is no interference with vision but in which the reflecting surface is protected from the tracheal blast and flying mucus during the introduction. The bronchoscope should always be inserted through a Jackson laryngoscope in order

Fig. 2.—The proximal end of the bronchoscope, showing the mirror-regulating screw mounted on the collar.

Fig. 3.—The proximal end of the bronchoscope, side view, showing (*A*) the mirror-regulating screw and (*B*) the rod as it enters the canal.

to avoid soiling of the mirror in the pharynx and larynx. Clouding of the reflecting surface by respiration can be counteracted by warming the bronchoscope to slightly above body temperature before using; the temperature will be maintained by the warmth in the tracheobronchial tree during the examination.

Should the mirror become clouded or soiled during an examination—as no doubt it will in the presence of excessive moisture—the following procedure is suggested: The mirror is brought into rectangular position. A Jackson broncho-

scopic sponge, folded double, is moistened in alcohol and introduced through the bronchoscope; with it the surface of the mirror may be vigorously rubbed to remove the obstacle to vision. The moist sponge is replaced by a dry sponge and the mirror is again rubbed until dry. If the bronchoscope fills with discharge, suction must be used, followed by drying with sponges before the mirror is cleaned. The ordinary suction attachment with a blunt end and perforations only on the side will obviously be ineffective in cleaning the mirror. A suction tube with an open end is required for this purpose.

The cooperation of the patient is always necessary in bronchoscopic examinations. If the importance of keeping the mirror clean is explained to him he will use all his will-power to control his cough in order to facilitate the procedure.

The bronchoscopist can best train his eye for this new procedure by practicing on a calf's or a good-sized lamb's lung. He will discover the optimal degree of inclination of the mirror which brings the entire bronchial lumen into view and will become oriented in this field. It is useful to make mirror object-image sketches with the mirror at various inclinations. If I may use the phrase: He must make himself mirror-minded for ready orientation.

Instead of being boiled the bronchoscope must be sterilized in alcohol on account of the mirror. It must be carefully cleaned and dried and occasionally oiled before it is put away.

The instrument was made by Pfau's American Instrument Company, New York.

106 East Eighty-Fifth Street.

AFTER-CARE OF PATIENTS FOLLOWING RADICAL MASTOID OPERATION

ALFRED LEWY, M.D., CHICAGO

Successful after-care of patients following radical mastoid operation presupposes a meticulously carried out bone dissection, with the roof straight out from the tegmen tympani and antri, no overhanging or otherwise obstructing bone, a mastoid cavity merging smoothly into the inner wall of the antrum, and a sloping floor with sufficient removal of the tip to have the same slope include it and the floor of the external canal. The facial ridge also should slope smoothly from the external (horizontal) canal and flatten into the slope of the floor. My own practice is to do nothing to the eustachian tube unless there is obvious necrosis, and to cleanse the tympanic cavity merely by wiping. If the curet is used it is only to lift out gently whatever débris may remain. As to the plastic operation, I prefer what is practically the Bondy, which is merely a splitting of the posterior part of the soft tissues of the canal, with no cutting into the concha except when this is necessitated by an unusually large cavity, in which event the flap must be suited to the cavity. The flaps are packed, without suturing, with petrolatum bismuth tribromphenate gauze, which is removed from the fifth to the seventh day. Treatment with powder is instituted without packing. The powder used is 1 part arsenic trioxide (As_2O_3) in 5,000 parts of impalpable boric acid powder. The arsenic trioxide must be added first to a small amount, say 1 part of arsenic trioxide to 100 parts of boric acid powder and thoroughly triturated for a couple of hours; this is then added to the balance of the boric acid powder and further well triturated. The arsenic trioxide is used as an epithelial stimulant, but if any

amount of it should be concentrated in the mass it would be a powerful destructive agent, as witness its use in skin cancers. I have used this powder for the past five years and believe it to be superior in result to the iodized boric acid powder or any other with which I have had experience. However, its use does not do away entirely with the occasional necessity of using the chemical cautery or mechanically removing granulations, so more recently I have adopted the so-called salt and pepper skin graft.

This type of graft was first used, I believe, by Dr. C. V. Russell [1] of Lansing, Mich., who used a sandpaper cylinder drawn across the skin of the patient's forearm, the filings being allowed to drop on the surface to be grafted.

The salt and pepper graft is not new, but so far as I know its use in the mastoid cavity following a radical operation is, and I shall therefore describe the technic in detail. The cavity is carefully cleansed and dried, no antiseptics being used except, perhaps, hydrogen dioxide. One of the hands of the patient is scrubbed with a sterile brush and green soap and carefully dried on a sterile towel, in which it is left wrapped for better drying until ready for use. No antiseptic, not even alcohol, is used. With a small rasp such as is used for removing calluses tiny particles of skin are filed off on a small piece of sterile paper previously grooved by folding. The drier the skin the more easily it is filed off. When 0.25 to 0.5 cc. of particles of skin accumulate the accumulation is transferred by being allowed to slide down the groove in the paper into the mastoid cavity, assisted, if necessary, by a little draft of air from a Politzer bag. There is placed in the cavity a piece of petrolatum-smeared gauze, which is left three days. In some cases the mastoid cavity has shown an increased discharge, which is followed by prompt healing and epithelization; in other cases it has healed without the increased discharge, but in all cases surprisingly fast and well. The grafting technic is used as soon as the cavity shows healthy granulations, about the end of the second or third week. There is a question in my mind whether or not there is an actual "taking" of the particles of skin in the sense of a graft, but certainly by some action the particles promote epithelization much more promptly than anything I have seen heretofore, and the technic is so simple that it commends itself for practical application.

The treatment with powder is usually begun about the end of the second week, and that with epithelial particles about the end of the third week.

25 East Washington Street.

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1. Russell, C. V.: New Method of Skin Grafting, J. Michigan M. Soc. **31**: 804 (Dec.) 1932.

Progress in Otolaryngology

Summaries of the Bibliographic Material Available in the Field of Otolaryngology

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ALLERGY AS RELATED TO OTOLARYNGOLOGY

W. W. DUKE, M.D.
KANSAS CITY, MO.

This year's literature is characterized by interesting advances in knowledge of the pathogenesis and pathology of allergy, new advances in knowledge of the etiology and pathogenesis of eczema and improvements in methods of treatment.

PATHOGENESIS OF ALLERGY

It is difficult in an article of this scope to take up the theoretical intricacies of the interesting advances which are being made in the study of the pathogenesis of allergy. For this the reader is referred to the presidential address presented before the Association for the Study of Allergy by F. M. Rackemann.[1] His experiments, showing that frequently repeated intradermal injections of foreign protein into the skin of animals or human beings sensitize first in a way which gives a red, tuberculin type of cutaneous reaction and later in a way which gives rise to a typical urticarial reaction, were reported in the 1934 review in the ARCHIVES.[2] Subsequent studies of tuberculous animals and human beings with this same technic by Dienes,[3] Simon [4] and Simon and Rackemann [5] showed that the changes in type of response to foreign proteins is much more rapid; in fact, it occurs after two or three inoculations under the influence of an infection. The first change

1. Rackemann, F. M.: A Review of the Phases of Allergy, J. Allergy **6**:17, 1934.

2. Duke, W. W.: Allergy as Related to Otolaryngology, Arch. Otolaryng. **20**:712 (Nov.) 1934.

3. Dienes, L.: The Immunological Significance of the Tuberculous Tissue, J. Immunol. **15**:141, 1928; Factors Conditioning the Development of the Tuberculin Type of Hypersensitivity, ibid. **23**:11, 1932.

4. Simon, Frank A.: The Development of Hypersensitiveness, unpublished experiments.

5. Simon, Frank A., and Rackemann, Francis M.: The Development of Hypersensitiveness in Man: I. Following Intradermal Injection of the Antigen, J. Allergy **5**:439, 1934.

causes a tuberculin type of reaction to foreign protein, which often rapidly ends in necrosis. The second change, which occurs after a few more inoculations, causes in both animals and patients the appearance of a typical urticarial lesion at the site of inoculation. The importance of this work cannot be overemphasized, since it tends to show that a person who has an infectious disease will respond more quickly to the effect of a parenterally introduced protein than will a normal person and that such a protein may render him allergic much more rapidly than it does the normal person. In other words, it may be assumed that an infectious disease increases the individual susceptibility to sensitization to foreign matter.

The relationship which is believed to exist between infections of the respiratory tract and allergy can be recalled by referring to papers by Cohen and Rudolph [6] and by Waldbott and Snell.[7] Both mention the fact that an allergic condition in the nasorespiratory tract may be complicated by infection and that an infection can be easily imposed on allergic tissue. These papers illustrate in substance the fact that what is commonly called a recurring cold or bronchitis is frequently allergy and that this can be easily diagnosed through personal history, family history and examination, both clinical and cytologic. They emphasize the importance of recognizing the allergic basis for infections of the respiratory tract and the fact that successful treatment depends on recognition of the allergic factor. Allergic coryza, bronchitis and asthma bear little resemblance to the same conditions caused by infection. It is not necessary, I am sure, to repeat the many points in the differential diagnosis between infections and allergy which have been mentioned so often in these reviews. However, it may be well to emphasize again the urgent need for the use of these diagnostic methods in cases of recurring coryza and bronchitis, both in adults and in children, since successful therapy, either medical or surgical, depends on a correct diagnosis.

PATHOLOGY OF ALLERGY

For the most recent developments in knowledge of the pathology of allergy the reader is referred to papers by Cohen and his associates and by B. S. Kline and A. M. Young.[8] These observers make a distinction between what they call reversible and irreversible allergic inflammations.

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6. Cohen, Milton B., and Rudolph, Jack A.: Allergic and Infectious Conditions of Upper Respiratory Tract in Children; Differential Diagnosis, J. A. M. A. **97**:980 (Oct. 3) 1931.

7. Waldbott, George, L., and Snell, A. D.: Pulmonary Lesions Resembling Pneumonia as the Result of Allergic Shock, J. Pediat. **6**:229, 1935.

8. Kline, B. S., and Young, A. M.: Normergic and Allergic Inflammation, J. Allergy **6**:247, 1935; Cases of Reversible and Irreversible Allergic Inflammation, ibid. **6**:258, 1935.

The reversible reactions, that is, those which disappear without leaving morphologic evidence of residual injury, are characterized by edema and eosinophilic infiltration; whereas the irreversible reactions, such as those which occur in tuberculous inflammations, are characterized, if severe enough, by necrosis. Residual changes in structure are then permanent. Since it is impossible to reproduce the beautiful illustrations shown in these articles and almost impossible to review the subject adequately without them, those who are interested are referred to the original sources for further information.

NEW ETIOLOGIC FACTORS

G. H. and E. C. Fondé[9] contribute a discovery to the subject of allergens in finding that "honey-dew" excreted in the form of numerous fine droplets by foliage insects can cause asthma. They state that in the South these droplets occur in such quantities at times that they can be observed in abundance on the windshields of automobiles and on glass slides placed under the trees. The saplike material appears under the microscope as small globules of resin-like substance. Sap gathered from the juicy bark of the trees presents similar globules. The Fondés state that the foliage pest inserts its sharp proboscis into the stomas of the leaves and sucks out the sap. Ants which climb the trees obtain the honey-dew from the foliage pests. "The tremendous industry on the part of the ants therefore would reasonably offer the source of an abundant escape of the practically pure live oak sap, which would allow droplets in the air under the trees." The authors observed a shower of honey-dew droplets on Christmas Day in 1933 after an outbreak of hay fever had occurred.

They state that they had failed to secure satisfactory relief from treatment in a certain number of patients whom they thought were sensitive to oak pollen and noted that attacks of asthma would come sharply and in advance of pollination of the oaks. They observed also that in persons supposedly sensitive to oak pollen cutaneous tests with oak pollen were not as frankly positive as was expected. These patients were then tested with an extract from the leaf and bark of the trees and gave more strongly positive reactions than with pollen but not as strong as when tests were made with honey-dew droplets obtained from an automobile windshield. The most potent extracts from the tree were obtained from the bark between the rough knuckles in the trunk. Treatment with the extract gave prompt relief to a patient who showed an intensely positive cutaneous reaction to oak sap. In this patient pollen therapy had been unsuccessful.

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9. Fondé, G. H., and Fondé, E. C.: "Honey Dew" from the Live Oak a Cause of Hay Fever and Asthma, J. Allergy **6**:288, 1935.

Duke [10] reports a study of four consecutive cases of asthma occurring among millers of wheat flour in which the illness was traced to the dust from the first cleaning of the wheat grain. In this dust the most conspicuous formed element (about 50 per cent by volume of the dust) consists of very fine, sharp-pointed wheat hairs. He believes that these hairs are an important factor in the causation of sensitiveness not only because they are able to penetrate and traumatize the bronchial membrane and possibly sensitize it to material intrinsic to the hair or attached to it, but also because of the fact that when wheat hairs are once lodged in the delicate mucosa of the respiratory tract they act as a foreign body and cause a foreign body inflammation in the tissues in addition to the sensitization phenomena. The asthmatic millers reacted violently to tests with extracts of the wheat hairs and gave much less severe or negative reactions to other fractions of the wheat grain.

Zitzke,[11] in studying the cause of eczema in 149 bakers, compared tests made with untreated flour and flour to which certain chemicals were added which are used in the preparation of flour for cooking. Sixty-seven per cent gave positive reactions to flour mixed with chemicals, in contrast to 41 per cent who gave positive reactions to untreated flour.

Harkavy and Romanoff [12] report positive cutaneous reactions to tobacco in 78 per cent of 69 cases of thrombo-angiitis obliterans. Only 9 per cent of the patients reacted to ragweed or timothy. They obtained positive reactions to tobacco in only 38 per cent of 200 unselected cases of men and women smokers. They conclude from their studies that tobacco is the dominating reacting allergen in cases of thrombo-angiitis obliterans.

Chobot [13] reports that in a study of 53 unselected patients in a clinic for children with asthma 19 gave slight reactions to tobacco extract; 22, moderate reactions, and 6, marked reactions. In 4 who gave the most marked reactions passive transfer could not be demonstrated. This differed from the studies of Harkavy and his associates, who demonstrated passive transfer in 13 cases. On account of the frequency of the finding of positive cutaneous reactions to tobacco in children, Chobot concludes that great caution should be used in interpreting a positive reaction as being of diagnostic value. He believes that positive reactions may be analogous to what is observed in testing cutaneously with wheal-producing solutions, such as morphine and histamine.

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10. Duke, William Waddell: Wheat Hairs and Dust as a Common Cause of Asthma Among Workers in Wheat Flour Mills, J. A. M. A. **105**:957 (Sept. 21) 1935.

11. Zitzke, Erna: Cause of Baker's Eczema, J. Indust. Hyg. **16**:218, 1934.

12. Harkavy, Joseph, and Romanoff, Alfred: Skin Reactions to Tobacco and Other Allergens in Normal Men and Women Smokers, J. Allergy **6**:62, 1934.

13. Chobot, Robert: The Significance of Tobacco Reactions in Allergic Children, J. Allergy **6**:383, 1935.

Simon [14] reports the study of a patient who was sensitive to the serum from mammals of many types but who was insensitive to the extract of raw muscle of chicken, mackerel and codfish and to the serum of frogs and human beings. Sensitiveness to the mammalian serum could be transferred passively to normal skins and could be desensitized by mammalian serum. Certain experiments are presented to show that the antigenic factor is a protein.

Interest in drug idiosyncrasies as factors in the etiology of both allergic diseases and diseases which have not as yet been placed in the category of allergy is increasing with great rapidity. Squier and Madison [15] review the literature and report on a series of 19 patients who had acute primary granulocytopenia attributed directly to the use of amidopyrine. They refer to 52 additional cases observed by other physicians. In 2 of their patients who recovered from the disease following discontinuance of amidopyrine the administration of one dose was followed by a rapid fall in the granulocyte count. The patients who recovered from the acute disease and avoided the drug had no recurrence of the illness. Cutaneous sensitivity was reported in 2 patients with systemic reactions, fever and reduction in the granulocyte count following the application of a 10 per cent solution of amidopyrine to the unabraded skin.

Sulzberger and Simon,[16] after a study of induced sensitization to arsphenamine in guinea-pigs, conclude that these animals can be sensitized to neoarsphenamine experimentally by intradermal injection and that this sensitiveness is specific for the arsphenamine complex. It does not induce sensitiveness to any other pentavalent or trivalent organic or inorganic arsenical and cannot be identified with sensitiveness to the element arsenic. They state that these findings correspond with those observed clinically in persons who are sensitive to arsphenamine.

Sulzberger,[17] in suggesting a classification for certain dermatoses, makes a distinction between reactions in the cutis, which appear after a period of hours or days in the form of eczema, and reactions in the subcuticular tissues, which appear promptly in the form of a wheal. He thinks that the former type of reaction is caused by substances which on contact can pass through the horny layer and the oily, sebaceous covering of the skin. Substances which are able to make this penetration he assumes to be those which can destroy, penetrate or mix with the

14. Simon, Frank A.: A Species Nonspecific Antigenic Factor in Mammalian Serums, J. Allergy **6**:1, 1934.

15. Squier, Theodore L., and Madison, Frederick W.: Primary Granulocytopenia Due to Hypersensitivity to Amidopyrine, J. Allergy **6**:9, 1934.

16. Sulzberger, Marion B., and Simon, Frank A.: Arsphenamine Hypersensitiveness in Guinea Pigs, J. Allergy **6**:39, 1934.

17. Sulzberger, Marion B.: A Suggestion for the Classification of Certain Allergic Dermatoses, J. Michigan M. Soc. **34**:78, 1935.

fatty, horny covering, such agents for example as oils which can be dissolved in the fatty substances of the epidermis, eczema-producing fungi, certain dyes and certain metals and local anesthetics, such as procaine and butesin, which have an affinity for ectodermal structures. He refers to a paper by Burghard on patients sensitive to alkalis who were found to have skins which were not so capable of neutralizing alkaline solutions as those of normal persons. He believes that the subcuticular reactions are caused by water-soluble substances which are unable to reach sensitive tissues through the normal unabraded skin. For a reaction of this sort the foreign substance must reach the sensitive tissue through traumatized skin or through the medium of the blood stream from distant points.

TREATMENT

Brown [18] reports further studies on maximum dosage in pollen therapy and states that after three years of added experience he draws the same conclusions that he did previously and that this speaks well for the effectiveness of the method. He states, as formerly, that results obtained in the treatment of hay fever and asthma due to pollen are directly proportional to the size of the maximum dose reached before the pollination season begins and that by gradually increasing the preseasonal dose to a maximum of from 100,000 to 200,000 pollen units failures are eliminated in therapy of hay fever and perfect results are practically assured. To reach this dosage he gives from 1 to 2 cc. of 10 per cent pollen extract. He says that this may be done with perfect safety and comfort provided care and judgment are used in regulating the preliminary increases in dose for each patient. He adds that with this method of therapy complete and permanent desensitization can be obtained with a disappearance of the positive cutaneous reactions.

Thiberge,[19] in making a study of nonspecific therapy in the treatment of asthma, compared the effect of histamine and typhoid split protein in the treatment of patients who had not responded well to specific treatment. He concludes that typhoid split protein and histamine are both useful in the treatment of allergy, whether respiratory, cutaneous, digestive or bacterial. He believes that typhoid protein is safer than histamine although not so rapidly effective. He also prefers the intradermal method of therapy. He states that injections of histamine often precipitate asthma, which can be controlled with epinephrine, and suggests that unusual care be maintained in the treatment of elderly persons.

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18. Brown, Grafton Tyler: Further Experiences with Maximum Dosage Pollen Therapy, J. Allergy **6**:86, 1934.

19. Thiberge, Narcisse F.: Histamine and Typhoid Protein Compared in the Control of Asthma and Hay Fever, J. Allergy **6**:282, 1935.

Cohen and Rudolph [20] report that extract of adrenal cortex used in the treatment of 4 selected patients with asthma failed to reduce the severity of the illness. The extract was given in doses which had relieved other patients who had Addison's disease and for that reason were considered to be adequate amounts for an asthmatic patient if the illness was due to insufficiency of the adrenal cortex. My experience with extract of adrenal cortex has been similar to that of Cohen and Rudolph.

Graeser and Rowe [21] report results obtained in 40 asthmatic patients treated symptomatically by the inhalation of a 1:100 solution of epinephrine nebulized with a glass atomizer. They state that good symptomatic results were thus obtained and that the method is easier for the patient to learn and use than the subcutaneous method of administration. Disagreeable constitutional effects were not observed.

IONIZATION

Several writers report favorable results obtained by ionization in the fall of 1934, but none of the results can be considered to be typical because during that drouth year the pollen content of the air was the lowest it has been since pollen counts have been recorded annually. I may say in passing that as much pollen was deposited on a greased slide in Kansas City, Mo., in one day in the fall of 1935 (September 15) as would have been deposited during the entire ragweed season in 1934.

H. L. and J. H. Alexander,[22] who have investigated ionization through work made possible by a gift secured from an anonymous donor, state that the mechanism by which a slough is formed in the nose after ionization was not investigated, although it seemed plausible to them that ionization is merely an effective form of cautery. They say that if this assumption is true, relief following ionization may be attributed to a mechanical removal of the antibodies from the nasal membrane. The restored mucous membrane is not sensitive; so inhaled or ingested allergens evoke no response. The authors attempted by means of ionization to determine how soon the newly formed epithelial tissue would become sensitive. They surmised that if the reagin content of the blood persisted sensitization would return as soon as the new nasal tissues absorbed antibodies from the blood. On the other

20. Cohen, Milton B., and Rudolph, J. A.: Studies on the Relation of the Adrenal Glands to Allergic Phenomena: III. On the Specific Therapeutic Effects of Cortical Adrenal Extract in Asthma, J. Allergy **6**:279, 1935.

21. Graeser, James B., and Rowe, Albert H.: Inhalation of Epinephrine for the Relief of Asthmatic Symptoms, J. Allergy **6**:415, 1935.

22. Alexander, H. L., and Alexander, J. H.: Ionization of the Nasal Mucosa: Relationship Between Reagins in the Blood and Effect of Treatment, J. Allergy **6**:240, 1935.

hand, if no reagin could be demonstrated in the blood the process of localization of new antibodies in the nasal membrane should be slower. These possibilities were the only ones investigated in their research.

In the cases reported the history of allergy was taken in the routine way and careful local examinations were made. This included a study of the nasal secretions and the noting of the relative number of eosinophils. Intradermal tests were made, and positive reactions were measured with a planimeter and recorded in square centimeters. Only decidedly positive reactions were recorded. Reagins were sought for by the usual technic of passive transfer of blood serum to normal skin. Counts were made of the eosinophils in the blood. The nose was then ionized, and the patient was reexamined at the end of two weeks and after three months. In some cases topical application of allergens which had caused trouble were made to the nasal mucous membrane before and after treatment.

The authors state that the series of cases studied was small and is reported on only in answer to the many queries concerning the rationale of therapy by ionization.

Fifty-three patients received treatment by ionization. Twenty-three were reexamined at the end of two weeks but failed to return at the end of three months. Five others were examined after two weeks but the period of three months has not yet expired. The results of treatment obtained in 25 cases are tabulated.

As a result of ionization the size of the initial cutaneous reaction did not change materially. The size of the reactions to passive transfer tests was somewhat variable, but this was attributed to the fact that it was not always possible to repeat passive transfer tests on the same persons. Eosinophilia was not particularly altered. Eosinophils persisted in the nasal secretions even of the patients who were relieved. Topical applications of the allergens produced a variable and inconsistent response. Seven of the 9 patients who did not secure any relief showed demonstrable reagins in the blood. Reagins were found in only 3 of a group of 11 who were relieved. The authors give as their preliminary conclusion from the results at hand that if patients have no reagins in the blood the chance of relief by ionization is greater.

News and Comment

AMERICAN BOARD OF OTOLARYNGOLOGY

An examination was held in Cincinnati on Sept. 14, 1935. Fifty-seven candidates were examined, of whom forty-two were certified and fifteen conditioned.

The Board will hold an examination in Kansas City, Mo., on May 9, 1936, during the meeting of the American Medical Association, and one in New York in October 1936 just prior to the meeting of the American Academy of Ophthalmology and Otolaryngology. The exact date of the latter has not yet been set. Prospective applicants for certificate should address the secretary, Dr. W. P. Wherry, 1500 Medical Arts Building, Omaha, for application blanks.

Abstracts from Current Literature

Ear

Otitic Hydrocephalus. Hugh G. Garland, Lancet **2**:751 (Sept. 30) 1933.

The intracranial complications of otitis media comprise many clinical and pathologic conditions; among them is a well defined syndrome for which the name "otitic hydrocephalus" was suggested by Symonds in 1931. This syndrome can usually be diagnosed on the basis of clinical manifestations, and it responds rather dramatically at times to simple therapeutic measures. The clinical manifestations of otitic hydrocephalus are: Its occurrence is confined almost entirely to children and young adults, complicating either acute or chronic otitis media; headache is frequent and may be either severe or slight; papilledema is constant, although vomiting and nausea are variable; the mental reaction is usually undisturbed, but dulness has been present in a few instances in which there has been a high grade of papilledema; the cerebrospinal fluid is under high pressure and of large volume but is normal chemically and bacteriologically. The condition usually clears up after weeks or months as a result of repeated lumbar puncture. If this procedure is not frequently carried out optic atrophy may ensue.

Beck, Buffalo. [Arch. Neurol. & Psychiat.]

Cases of Aural Vertigo Amenable to Treatment by Ossiculectomy. James Dundas-Grant, Lancet **2**:1029 (Nov. 4) 1933.

According to Dundas-Grant, certain cases of aural vertigo are suitable for ossiculectomy. Vertigo, either constant or in attacks, headache, convulsions and loss or diminution of hearing acuity were among the symptoms which the patients presented. In all cases one or both of two conditions were present. Either the ossicles obstructed the outlet of the attic and so prevented the escape of thickened discharges or the ossicles were fixed, leading to an immobility of the otherwise mobile stapes. Thus, in the former condition, the removal of the ossicles permitted the free escape of the contents of the attic with relief from headache and vertigo and to some extent from dulness of hearing. In the latter condition, the restored mobility of the stapes provided the normal safety-valve for variations of intralabyrinthine tension, with disappearance of the vertigo. Ten of the patients who were operated on were entirely cured, and the other two were much relieved of their symptoms.

Beck, Buffalo. [Arch. Neurol. & Psychiat.]

Facial Paralysis and Labyrinthitis: Anatomic Examination of the Facial Nerve. André Thomas and L. Girard, Rev. d'oto-neuro-opht. **11**:664 (Nov.) 1933.

A patient entered the hospital on Dec. 5, 1932, with facial paralysis of peripheral type on the right side and pain in the teeth and ear. In 1921, 1922 and 1929 she underwent several operations for osteomyelitis of the humerus. Three months before her admission to the hospital a vertiginous attack, with diminished hearing in the right ear, had occurred. Examination revealed a normal drum membrane, total deafness of the right ear, a few nystagmus twitches and almost total paralysis of the right facial nerve; no Romberg sign or spontaneous deviation was present. There were no signs of cerebellar disease. Lumbar puncture on December 8 revealed 696 polymorphonuclears per cubic millimeter. On December 9 the ear began to discharge, and a positive Kernig sign and stiffness of the neck were observed; the spinal fluid contained 845 cells per cubic millimeter. Operation revealed a normal mastoid process, but the tympanum was filled with pus which

came from a large extradural abscess by way of a fistula through the oval window. The labyrinth was opened. Drainage was inadequate, and the patient died in coma six days later. At autopsy the fistula was found to open on the endocranial surface slightly external to the fallopian hiatus, having passed above the elbow of the fallopian aqueduct and the seat of the geniculate ganglion. Serial sections of the facial nerve, including the geniculate ganglion and extending to the endocranial portion, showing the following changes: The connective tissue sheath was thickened and contained masses of nuclei; these masses were sparse in the geniculate ganglion; the pericapsular cells were not proliferated; the masses were composed of fibroblasts, plasmocytes and mononuclear and polymorphonuclear cells. The masses were numerous at the level of the passage of the petrous nerves into the facial nerve. The lesions situated in that portion of the nerve inside the ganglion and in the internal auditory meatus were the most intense. Foci of hemorrhage in the sheath and in the nerve itself, separating the fibers by pools of blood, were present. The nerve fibers were poorly stained, and the axis-cylinders were swollen, irregular and disaggregated. The neighboring arachnoid showed considerable proliferation of nuclei but relatively few polymorphonuclear cells. The assumption is that a benign otitis complicated by labyrinthitis occurred in September and that the process remained latent until the facial paralysis occurred. The hypothesis is suggested that staphylococci from the site of the osteomyelitis might have hibernated in the labyrinthine capsule, where they remained until awakened to activity by some favorable circumstance. It is known that staphylococci have the ability to live a long time in osteomyelitic foci and to emigrate and that they have a predilection for osseous tissues when their primary seat has been in bone.

DENNIS, San Diego, Calif. [ARCH. NEUROL. & PSYCHIAT.]

EPILEPTIC CRISES CAUSED BY A JUXTAMENINGEAL FOCUS OF INFECTION IN A PATIENT WITH OTOGENOUS CEREBRAL ABSCESS—OPERATED ON SEVERAL YEARS PREVIOUSLY. E. R. CASTELNAU, Rev. d'oto-neuro-opht. **11**:680 (Nov.) 1933.

A man, aged 40, who had recovered ten months previously from an otogenous cerebral abscess on the left side, complained one evening of a sudden attack of headache, began to talk volubly and incoherently and saw double. After a quiet night, a typical epileptic attack occurred the next morning. Irritation from a small persistent focus of infection near the meninges was suspected. The old wound was reopened, a block of fibrous tissue corresponding to the meningeal cicatrix was loosened, and some granulations were removed from the former site of the mastoid antrum. Recovery was prompt. In two years there have been no more convulsive crises, and headaches have been rare. This condition must be distinguished from the vertiginous auricular epilepsy reported by Roger and Reboul-Lachaux. The appearance of epilepsy in the course of an infection of the mastoid suggests a cerebral complication. Cases like the one reported are rare. Only two have been reported.

DENNIS, San Diego, Calif. [ARCH. NEUROL. & PSYCHIAT.]

A GLYCERIN PREPARATION IN THE THERAPY OF THE EUSTACHIAN TUBE. P. J. MINK, Arch. f. Ohren-, Nasen- u. Kelhkopfh. **139**:121 (Jan. 24) 1935.

Mink calls attention to the therapeutic action of a preparation which contains 5 per cent antipyrine and certain anesthetics in a glycerin that is entirely free from water. He administers it in the eustachian tube in cases of acute inflammation and catarrhs of the tympanic cavity. He says that it may be applied also in the auditory meatus, but that the tubal application alone is effective. He thinks that the withdrawal of water by the glycerin is the most important factor. He also employs the glycerin preparation in the treatment of chronic catarrhs of the eustachian tube. In these cases he is convinced that the anesthetic action of the remedy is of no significance, and that the dehydration by the glycerin is the most important factor.

EDITOR'S ABSTRACT.

CHANGES IN TEMPORAL BONE IN PATIENTS WITH TUMOR OF ACOUSTIC NERVE. H. BRUNNER, Monatschr. f. Ohrenh. **69**:177 (Feb.) 1935.

Brunner describes the changes he observed in two additional cases of tumor of the acoustic nerve. He gives a detailed description of the microscopic aspects of the temporal bones and reaches the conclusion that these cases differ greatly from the two cases he reported in the previous paper, for the dilatation of the internal meatus was absent in both cases, as was the severe atrophy of the nerve terminals in the internal ear. In a later report he hopes to explain the differences between the two groups of cases.

EDITOR'S ABSTRACT.

THE CHOLESTEATOMA IN RELATION TO BLOOD CHOLESTEROL. K. A. DRENNOWA, Ztschr. f. Hals-, Nasen- u. Ohrenh. **37**:212, 1935.

Drennowa investigated (1) whether the cholesteatoma is the result of a disturbance in the cholesterol metabolism and (2) whether the cholesteatoma is the result of a local reaction of the tissues to chronic irritation. She reaches the following conclusions: 1. The cholesterol content of the blood is no indication of the presence of a cholesteatoma. 2. The cholesteatoma is not caused by a general disturbance in the cholesterol metabolism but is rather the result of a disorder of the local tissue metabolism. 3. The high incidence of the cholesteatoma in cases of epitympanitis (67 per cent of all cases) indicates that in this form of chronic otitis there exists an excess of lipoids together with a local disturbance of the cholesterol metabolism in the tissues of the middle ear. 4. Histologic examination of the granulations and polyps for the presence of lipoids discloses the presence of a large quantity of sudanophil cells in the cases which are especially severe as regards the clinical as well as the pathologic-anatomic aspects. 5. The destructive action of such sudanophil granulations and polyps justifies their classification with the cholesteatomas, and because of their clinical and pathologic-anatomic similarity to cholesteatomas they may be designed as "microcholesteatomas."

EDITOR'S ABSTRACT.

Larynx

ACUTE LARYNGOTRACHEITIS. A. CLEMENT SILVERMAN, Arch. Pediat. **51**:257 (April) 1934.

Attention is directed to obstructive inflammations of the larynx and in particular to the entity acute nondiphtheritic laryngotracheitis. All obstructive conditions of the larynx produce much the same picture and are most prevalent in children under 5 years of age during the winter season. Hoarseness, a barking cough, stridor, aphonia and later, with increasing obstruction, dyspnea and cyanosis are common symptoms and signs. Every patient with laryngeal obstruction of an inflammatory nature should be examined with the laryngoscope and the bacteriologic status of the inflammation determined, in order that proper therapeutic measures may be employed. It is not enough to administer diphtheria antitoxin on suspicion. The Schick test affords a valuable aid in rapid diagnosis of the etiology of the obstruction.

WADDELL JR., University, Va. [AM. J. DIS. CHILD.]

LARYNGEAL HEMIPARESIS FOLLOWING ADMINISTRATION OF ANTITETANIC SERUM. HENRI ROGER and MAURICE BRÉMOND, Rev. neurol. **1**:453 (March) 1934.

A patient with this condition showed typical urticaria and pains in the joints following the use of antitetanic serum as a prophylactic. Suddenly dysphonia appeared, which was shown by laryngoscopy to be due to paralysis of the right vocal cord, with involvement of the epiglottis. Since local causes of the lesion were ruled out, the authors consider this condition to be a neuritic complication of serotherapy.

DAFFINEE, Boston. [AM. J. DIS. CHILD.]

MECHANISM OF FALSE VOCAL CORDS IN RELATION TO RECURRENT NERVE: ACT OF SWALLOWING. A. RÉTHI, Monatschr. f. Ohrenh. **69**:129 (Feb.) 1935.

This is one of a series of investigations in which Réthi studied the innervation of the larynx. He points out that the larynx is important in three respects: as a respiratory organ, as a tone-forming organ and finally as a door of the deeper air passages, as which it must prevent the entrance of foreign bodies into the air passages. The latter function is especially important during the act of swallowing. In this report, he concerns himself with experiments which he carried out in order to determine the function of the larynx during the act of swallowing, giving his attention to the muscles and nerves by means of which the larynx performs its part during the act of swallowing. He made his tests on dogs. He agrees with Abderhalden, who maintained that swallowing is not a voluntary act. This may seem unusual when one considers that one is capable of swallowing at any time. However, one is able only to elicit, not execute, the act of swallowing. One produces a stimulus, usually by bringing saliva onto those portions of the mucosa that are under the influence of the superior laryngeal nerve. Here the reflex of swallowing is elicited, but the complicated mechanism of swallowing follows compulsory paths. If one attempts to swallow dry, the whole mechanism fails. Moreover, if the aforementioned portion of the mucous membrane is rendered insensitive, that is, if the center of swallowing is prevented from receiving a stimulus, swallowing does not take place. Réthi states that the results of his experiments corroborate this theory of Abderhalden's. He describes nine different experiments and shows a number of pictures that he took with a slow motion cinematograph. His experiments disclosed that swallowing is entirely normal only if all laryngeal nerves are unimpaired. However, even if both the recurrent nerves have been paralyzed, the glottis is completely closed and the laryngeal process of swallowing shows hardly any deviations from the normal function. If the internal branch of the superior laryngeal nerve is severed, but the recurrent nerve is left unimpaired, no impairment of the act of swallowing is noticeable. However, if, on the same side, the internal branch as well as the recurrent nerve is severed, a considerable retardation of the paralyzed side is noticeable during swallowing. This indicates that the internal branch of the superior laryngeal nerve and the recurrent nerve are of equal importance in the laryngeal process of swallowing. He further shows that impairment of the transverse muscle is of great importance in the act of swallowing. He points out that the recurrent nerve sends an important branch into the transverse muscle, that the superior laryngeal nerve has important branches in this muscle and that within this muscle there is an anastomosis between the inferior and superior laryngeal nerves. His studies revealed also what muscles play the most important rôle in the laryngeal act of swallowing. In dogs, they are the transverse muscle, the detrusor epiglottidis and the cricothyroid muscle; in human subjects, the obliquus muscle likewise plays a part.

EDITOR'S ABSTRACT.

Nose

URGENT TREATMENT OF ACUTE RETROBULBAR OPTIC NEURITIS OF SINUS ORIGIN: PHENOLIZATION. M. TERRACOL, Rev. d'oto-neuro-opht. **12**:401 (June) 1934.

Terracol reviews the subject of the treatment of acute retrobulbar optic neuritis and states that the confusion existing is due to the following factors: 1. Ocular disturbances are in the domain of pure ophthalmology, and yet they have been the subject of discussion by rhinologists. 2. The definite formula that retrobulbar optic neuritis is always due to infection in the sinuses and requires intervention on the sphenoid sinuses has been imposed. 3. The term retrobulbar optic neuritis was introduced by von Graefe to designate lesions more highly situated in the optic nerve than those which cause peripheral paralyses. Ophthalmologists themselves argue over the pathogenic and symptomatic substratum of retrobulbar optic neuritis.

The present tendency is no longer to regard neuritis as a special malady but under this term to include all diseases of the posterior segment of the optic nerve (between the chiasm and the point of penetration of the central vessels of the retina). Histologic studies do not show that the nerve structure is altered by the penetration of the retinal vessels. Hence, this subdivision of the nerve has only a topographic value. Not all patients with retrobulbar optic neuritis recover spontaneously, and in about 50 per cent of the cases the etiology is not discovered.

In collaboration with Canuyt, Terracol has conducted researches on retrobulbar neuritis for several years. The conclusions are that an infection of the posterior sinuses or the bacterial toxins can easily reach the optic nerve; the causal factors may be arranged in the following order: syphilis, infectious rhinosinusitis, disseminated sclerosis, heredity, intoxications and vasomotor disturbances. Syphilis is too often forgotten; but, on the other hand, systematic treatment in the face of the lack of all signs of syphilis is a fault, because each day the lesion progresses. Sinusitis does not always mean the formation of pus; there are various grades of inflammation. The etiology of sinusitis ought not to be disregarded, and intervention must often be early; all patients with optic neuritis should have a thorough rhinologic examination. Per contra, sinusitis alone must not be assumed. It is the duty of the rhinologist to furnish the ophthalmologist with as precise data as possible on the state of the sinuses. Special methods of examination are required: shrinking of the region with cocaine and epinephrine, catheterization and puncture of the sinuses and the taking of roentgenograms. The ophthalmologist must direct the treatment and determine the indications for operation. Trepanation of the sphenoid sinus is the most logical procedure, but it should be reserved for serious cases. When the condition is unilateral and evolves slowly, with signs often atypical, excellent results are obtained by phenolization. Under close control by the oculist, if the disease is not ameliorated, immediate operation on the sinuses is indicated.

DENNIS, San Diego, Calif. [ARCH. NEUROL. & PSYCHIAT.]

UNILATERAL BLINDNESS: LATENT CLOSED EMPYEMA OF A POSTERIOR ETHMOID CELL: RECOVERY FOLLOWING OPERATION. L. CERISE, J. RAMADIER and H. GUILLON, Rev. d'oto-neuro-opht. **12**:499 (July-Aug.) 1934.

A man, aged 32, entered the hospital with the complaint of loss of vision in the left eye and periorbital pain for the previous eight days. Examination revealed a slightly swollen and edematous papilla and an enormous central scotoma in the left eye. Vision was limited to a narrow crescentic area with its concavity downward. There was no sign of nasal suppuration, and the roentgenographic examination showed no evidence of involvement of the sinuses. Since the vision rapidly diminished to complete blindness, resection of the septum and exploration of the posterior sinuses were done. Two cubic centimeters of thick fetid pus was evacuated from a posterior ethmoid cell. The operation was not extended farther. Improvement was immediate, and at the end of the eighth day the visual field and the papilla were normal, and vision was 9/10. From an ophthalmologic point of view, this case was one of optic neuritis with functional signs quite different from those of the classic form. The authors agree with Portmann and Pesme that the association of functional signs of retrobulbar neuritis with papillary lesions and painful symptoms suggests that these ocular disturbances originate from an infected sinus. In such cases, even when the nasal examination gives negative results, an early exploratory operation on the ethmoid and sphenoid sinuses is indicated.

DENNIS, Colorado Springs, Colo. [ARCH. NEUROL. & PSYCHIAT.]

STRUCTURE OF LOWER (NASAL) SECTION OF NASOLACRIMAL DUCT. L. A. ZARITZKY, Monatschr. f. Ohrenh. **69**:166 (Feb.) 1935.

Zaritzky shows that opinions about the structure of the lower portion of the nasolacrimal duct are still divided. Some investigators maintain that there are valves at the lower end, while others deny this. He studied the structure of the

nasolacrimal duct on the corpses of ten children and twenty-two adults. He found that the fibrous layer of the nasolacrimal duct consists of numerous connective tissue fibers with many closely adhering elastic fibers that run parallel to the longitudinal axis of the canal. In addition to the longitudinal fibers, there are also transverse and oblique fibers which fix the longitudinal fibers, so to speak. In some portions of the duct, particularly at its end, where some authors assume the valve to be, there are circular, usually elastic, fibers that form a sphincter and close the canal. Zaritzky was unable to detect a typical valve, but quite often he observed in its place a protrusion of the mucous membrane into the lumen of the canal, apparently as the result of an inward pressure of the circular fibers that are located there. In some specimens he observed near the connective tissue sphincter (two or three such sphincters were detected in the examined section of the duct) smooth muscle elements, which apparently increase the activity of these sphincters. The bundle of circular fibers is especially noticeable in persons over the age of 16 years. During early childhood, the accumulation of these fibers is much less noticeable. He thinks that this might be the reason that children are more subject to conjunctivitis of nasal origin. Moreover, this applies also to persons with chronic atrophic rhinitis in whom, as the result of atrophic changes in the mucous membrane of the nasolacrimal duct and of a weakness of the circular fibers, the lumen of the duct gapes so that micro-organisms and nasal secretion may enter into the duct. Zaritzky states further that between the periosteum and the fibrous layer of the duct, particularly in its lower portion, there is a close venous net, which apparently is closely connected with the cavernous plexus of the nasal cavity. In young children the cavernous plexus is incompletely developed. He observed that in children the opening on the lower part of the nasolacrimal canal is ellipsoid or cleftlike, while in the aged the opening is usually triangular, probably because the contracting power of the circular fibers decreases with advancing age.

EDITOR'S ABSTRACT.

SYMPTOM COMPLEX OF NASOCILIARY NERVE. I. ABRAMOWICZ and T. WASOWSKI, Monatschr. f. Ohrenh. **69**:171 (Feb.) 1935.

Abramowicz and Wasowski call attention to the syndrome of the nasociliary nerve, which was first described by Charlin in 1930. It consists of: (1) inflammatory manifestations in the anterior portion of the eye, namely, conjunctivitis and inflammation of the cornea, iris and ciliary body; (2) a unilateral inflammation of the nasal mucous membrane with considerable hyperemia and swelling of the involved side and with hyperemia of the anterior portion of the lower nasal concha, and (3) neuritic pains in the eyeball, in the orbital cavity and in the frontal region, together with disturbances of secretion (reddishness and sweating) and with trophic cutaneous changes (blisters) in the region of the ramifications of the nasociliary nerve. Moreover, there is a tactile hyperesthesia of the skin in the region of the ramifications of the infratrochlear nerve and of the external branch of the anterior ethmoidal nerve. The authors point out that the syndrome of the nasociliary nerve is not always fully developed. In some cases the ocular symptoms predominate, while in others the nasal symptoms are most noticeable. They state that Charlin considered the forms with an incomplete symptomatology more frequent than the ones in which it is complete. Because the syndrome is the result of an inflammation of the nasociliary nerve, and in order to give a better insight into the different symptoms, they describe the anatomy of the nasociliary nerve. Further, they show that the inflammation of the nasociliary nerve may be caused by various factors; it may be of local origin or may be caused by systemic disease or by focal infection. They illustrate this by case histories. In the conclusion they mention the part played by the nose in the development of nervous disorders, pointing out that irritation of the trigeminal nerve may lead to disorders in distant organs.

EDITOR'S ABSTRACT.

EXTRANASAL PUNCTURE OF THE FRONTAL SINUS. U. GITTEL, Ztschr. f. Laryng., Rhin., Otol. (Teil 1: Folia oto-laryng.) **25**:371, 1934.

Gittel gives a history of external puncture of the frontal sinus, reviews the various methods and then describes the technic that is employed at the clinic in Heidelberg. Following this, he outlines the method that is employed in Würzburg and describes seven cases in which external puncture of the frontal sinus was done after this method. In all these cases the puncture was made for diagnostic purposes. In five cases it was followed by radical operation. In most cases it disclosed what could be expected on the basis of the roentgenologic and clinical aspects. However, in one case the observations in the course of the subsequent radical operation did not corroborate what had been indicated by the puncture, for the operation disclosed an intact mucous membrane in the frontal sinus, while the syringe that had been introduced following the exploratory drilling had contained secretion and particles of the mucous membrane. In two instances the exploratory puncture disclosed such slight changes that the radical opening of the frontal sinus was considered unnecessary, and the conservative treatment produced the desired results. In one instance the puncture of the frontal sinus took a serious course. This experience and the fact that the method is diagnostically not entirely reliable induced Gittel to discontinue the external opening of the frontal sinus for diagnostic purposes. He concedes that the method employed in Heidelberg, with its subsequent irrigation through a permanent cannula, may be better, but he himself has refrained from resorting to it in recent years. At any rate, he thinks that good roentgenograms are of first importance. The roentgenologic exposure should be made not only in the occipitofrontal direction but also from the side so as to determine the depth of the frontal sinus. He thinks that the posterior wall is often believed to be much thicker than it actually is. Often it is as thin as paper, and this fact together with the slight depth of the sinus involves the danger of an artificial injury of the posterior wall. He concedes that his material is too small to make it the basis of a complete rejection of the external puncture of the frontal sinus. However, he thinks that the dangers involved in the method make extreme caution necessary.

EDITOR'S ABSTRACT.

PLASTIC CLOSURE OF A BUCCO-ANTRAL FISTULA DEVELOPING AFTER OPERATION ON THE MAXILLARY SINUS. L. STRACK, Ztschr. f. Laryng., Rhin., Otol. (Teil 1: Folia oto-laryng.) **25**:379, 1934.

Strack points out that formerly plastic closure of a bucco-antral fistula was more frequent since the bucco-antral opening was not closed at once but was left open until the cavity had healed. At present it is the tendency to close the wound at once, but even in case of primary closure there occasionally remains a fistula. Such a failure of primary closure is frequently the result of erroneous evaluation of the relation between the dental system and the maxillary sinus. The dental origin of a disorder of the maxillary sinus is often entirely overlooked. After discussing some of the dental aspects of the disorders of the maxillary sinus, Strack reviews the literature on the various methods that have been suggested for the plastic closure of bucco-antral fistulas. He considers the condition of the surgically treated maxillary sinus as the most important factor in the closure of the buccal wound. He thinks that this alone explains the favorable results that are obtained with the radical operation according to Caldwell-Luc, in which in spite of a rather large bone defect a mere suturing of the wound nearly always results in primary healing, provided the possibility of dental after-infection has been excluded. He reports that at the Marburg clinic only 18 of a total of 475 operations on the maxillary sinus resulted in bucco-antral fistulas. He describes and discusses these 18 cases. Only 3 of the fistulas that required plastic operations developed after uncomplicated operations according to Caldwell-Luc. In 3 other instances the bucco-antral fistula was the result of trauma, and in all other cases a complication on the part of the dental system could be demonstrated. This

indicates that in all cases in which the fistula proves refractory it is necessary to consult a dentist. Strack always tried first a primary closure of the buccal wound, even in complicated cases in which large cysts existed. In the 7 cases in which a bucco-antral fistula existed before the operation on the maxillary sinus the plastic closure of the fistula was attempted immediately following the operation, or the fistular canal was freshened. In 3 instances this measure was successful, and in the others the size of the fistula decreased. Whenever a fistula remained, an attempt was made to find the cause of the antral disease by examining and treating the teeth. After that, simple measures, such as freshening and suturing of the fistula or curettage of the fistular canal, were usually sufficient. In the few cases in which a plastic closure was needed, he did not adhere to a certain method but adapted the treatment to the individual requirements.

EDITOR'S ABSTRACT.

STATISTICAL DATA ON INFLAMMATIONS OF NASAL SINUSES. F. WILKER, Ztschr. f. Laryng., Rhin., Otol. (Teil 1: Folia oto-laryng.) **25**:404, 1934.

Wilker calls attention to Gräff's new technic of necroptic examination of the upper air and food passages. If this method is employed, the maxillary sinuses, the ethmoid cells and occasionally even the frontal sinus are exposed and laid open for inspection during extraction of the necroptic preparation. The sphenoid sinuses can be exposed on the extracted preparation by sagittal and frontal sections. Wilker employed this method in 2,317 cases. Because the nasal sinuses of children less than 1 year of age are not fully developed their cases were disregarded. The report covers 2,072 cases. Among this number, he found 144 cases of suppurating sinusitis, that is, a percentage of 6.9. In more than half of these cases one of the maxillary sinuses was involved. The incidence of sinusitis was lowest in the frontal sinuses and in the ethmoid cells. In analyzing the material according to age groups, Wilker observed a higher incidence of sinusitis in children from the second to the tenth year of life and in adults beyond the age of 80 years. The incidence was lowest in persons aged between 10 and 40 years. There was a slightly greater incidence of sinusitis in men than in women. Seasonal fluctuations could not be observed. In comparing his results with those of other investigators he found that the incidence of sinusitis in his material was considerably lower; he thinks that this may be partly explained by the fact that his material was considerably larger than that analyzed by the other authors.

EDITOR'S ABSTRACT.

DEPRESSION FRACTURE OF THE ROOT OF THE NOSE. K. VOGEL, Ztschr. f. Laryng., Rhin., Otol. (Teil 1: Folia oto-laryng.) **25**:426, 1934.

Vogel is of the opinion that fractures of the nasal bones can usually be reduced; that is, that the bones can be raised to their normal position by introducing a blunt instrument into the nasal cavities, forcing the depressed bones upward and then bringing them into normal position by lateral pressure. However, this method cannot be employed when, in addition to the nasal bones, the root of the nose and the anterior wall of the frontal sinus have sustained a depression fracture. He describes such a case. An attempt to raise the depressed bones to their normal position from the inside of the nose failed because the instruments could not be brought under the deepest point of the depression. Consequently, an effort had to be made to replace the pressure from within by traction from without. This measure proved successful, and the patient's recovery was uneventful. Vogel illustrates the efficacy of the treatment by means of photographs of the patient, taken before and after the treatment. He considered this report justified because the literature contained no reference to the traction method employed by him. He recommends this method and thinks that it should always be tried before surgical reposition is resorted to.

EDITOR'S ABSTRACT.

Miscellaneous

INTERNAL STUTTERING. H. FREUND, Monatschr. f. Ohrenh. **69**:146 (Feb.) 1935.

Freund's studies on internal stuttering are chiefly the result of observations on himself. He points out that several other authors who investigated stuttering in themselves stress the preexperience of the sound difficulty, and in observations on himself he discovered the same. To him, this preexperiencing of the speech difficulties appears as an internal stuttering that is entirely analogous to external stuttering. The pathologic adjustment movements elicited by the extremely vivid imagination of the feared difficulty are the somatic correlation of this internal stuttering. The ego experiences itself as stuttering, when, prepossessed by the difficulty, it internally expresses the words to itself in a testing preexperience, and in this process discovers the difficult word. Thus, internal speaking and the initial motor movements connected with it play an important rôle in internal as well as in external stuttering. Whereas, former investigators stressed the imagining of erroneous speech movements as the important factor in stuttering, these observations stress instead the disturbed attempt at internal speaking. Freund shows that many of the psychologic peculiarities of stuttering are made possible by the phenomena of internal speaking. In the further development of the disorder an introverted deviation takes place. The internal speaking becomes the censor that is placed between thought and external expression of speech. Internal stuttering is accompanied by different somatic manifestations. Respiration may become inhibited, the head may be held stiff, and the look may become staring. Self-observation of the stutterer discloses feelings of tension and disagreeable sensations in the larynx and at the sites of articulation. In discussing the treatment, Freund suggests, in addition to psychotherapy, clear internal speaking with emphasis on the voice factor, on the extension of the syllables and on the rhythm and melody and with overemphasis on rest. This modified internal speaking could eventually be supported by toneless movements of the organs of articulation. Moreover, an attempt may be made to overcome the internal stuttering by directing the attention to indifferent speech activities. The attention should be taken away from experiences in the patient's own body, such as the heaviness of the extremities, the stream of respiration and so on.

EDITOR'S ABSTRACT.

RARE FORMS OF PATHOLOGIC CORNIFICATION OF THE MUCOSA OF THE UPPER RESPIRATORY AND DIGESTIVE TRACTS. G. CLAUS, Ztschr. f. Hals-, Nasen- u. Ohrenh. **37**: 228, 1935.

Claus relates the clinical histories of six patients in whom cornifications developed on the mucosa of the upper food and air passages. In one patient a whitish thickening developed on the right vocal fold. The histologic examination disclosed a pachydermia with chronic nonspecific inflammation and acanthosis and pseudokeratosis of the epithelium. The second patient had whitish areas on the left side of the tongue, which were noticeably elevated above the level of the mucosa. Between these whitish areas there were bluish areas in which the mucosa was atrophic. Keratosis follicularis (Darier's disease) and leukoplakia were thought of. Since the patient's skin was free from changes of this nature, Darier's disease was ruled out, and the condition was diagnosed as leukoplakia. Claus points out that the histologic aspects of leukoplakia resemble greatly those observed in the cornification of the first patient. The third patient had a small tumor on the tongue, which was diagnosed as papilloma verrucosum. This tumor was removed, and the histologic examination revealed considerable cornification of the epithelial portions. The scar that resulted from the removal of the tumor acquired the aspects of a leukoplakia. The fourth patient had immediately above the uvula a circular area that was covered with snow-white cones and spines. Postrhinoscopy revealed that the nasal surface of the soft palate was also covered with white cones and spines. There was considerable fetor from the mouth and nose. Biopsy revealed a cornified papilloma without signs of carcinoma. The tumor was

treated with radium, electrocoagulation and electrotomy, and the patient was discharged. A control examination nine months later disclosed no further tumor growth. The fifth patient had a papilloma of the right vocal cord with considerable cornification. That the cornified papillomas, which generally are benign tumors, may result in malignant degeneration, the author illustrates by reference to the last patient. The histologic examination of the tumor masses disclosed atypically proliferated epithelial nests. The author points out that the cause of these cornifications is not definitely known, but calls attention to the fact that cornification is more frequent in men than in women. Of the six cases reported here five concerned men. He emphasizes that the benign cornifications in the region of the air and food passages must be kept under observation, for malignant degeneration may result.

EDITOR'S ABSTRACT.

PROGRESSIVE UNILATERAL FACIAL ATROPHY TREATED WITH A MALLEABLE RUBBER PROSTHESIS IN THE MOUTH. H. W. BØE, Acta psychiat. et neurol. **9**:1, 1934.

Bøe reports remarkable results obtained in a case of severe progressive unilateral facial atrophy in a woman, aged 38. The treatment consisted of placing in the mouth a specially devised dental prosthesis made of malleable rubber so as to fill the hollows that resulted from progressive wasting of the bone and soft tissue. The prosthesis can be molded from time to time according to requirements of adjustment. Apart from the immediate cosmetic results thus obtained, the atrophic process was brought to a standstill, and in the course of time an actual improvement in the trophic condition of the tissues on the affected side of the face became manifest. The integument over the forehead, cheek and chin recovered its normal color, consistency and ability to show vasomotor reactions (blushing) which previously had been lost. The condition of the bone also improved. The author attributes these effects to the stimulation of the tissues by the pressure and irritation exerted by the prosthesis.

YAKOVLEV, Palmer, Mass. [ARCH. NEUROL. & PSYCHIAT.]

Book Reviews

Le traitement des hémorragies et la transfusion sanguine d'urgence en oto-rhino-laryngologie. By C. Canuyt, professeur, de clinique oto-rhino-laryngologique, et Ch. Wild, chef de clinique oto-rhino-laryngologique, à la Faculté de Médecine de Strasbourg. Paper. Price, 35 francs. Pp. 206, with 10 illustrations. Paris: Masson & Cie, 1935.

The first part of this work is devoted to a discussion of hemorrhage and its management. The authors review the various hemorrhages that may occur in the field of otorhinolaryngology. These are considered as surgical, immediate or delayed; medical or spontaneous and the hemorrhagic diatheses. All the classic methods of meeting these emergencies are described in detail. The authors are almost dogmatic in their insistence that when simple methods fail the physician should not temporize but resort to blood transfusion; the earlier this is employed the less the danger encountered and the more satisfactory the results obtained. Under the heading of hemorrhagic diatheses are grouped the hemophilias, the more or less vicarious hemorrhages and acquired blood dyscrasias. Spontaneous or accidental hemorrhages, in this group, are successfully controlled by blood transfusion, and these patients can be comfortably and safely prepared for necessary surgical procedure by the same method. The authors minutely outline their method of choice in the different types of hemorrhage according to conditions and individuals. A searching family history is indicated in the case of patients to be operated on to rule out hemorrhagic diatheses. The authors emphatically maintain that blood transfusion is the safest and most effective measure in controlling alarming hemorrhages.

The second part of the publication is concerned with a very interesting history of blood transfusion, the establishment of transfusion centers and technic. The historical feature is academic. The account of the organization of transfusion centers is of medical interest. The blood of the personnel of the hospital is typed, and these persons are regarded as voluntary donors to supplement the professional donors, adequately investigated and reasonably available. Great care is exercised in the selection of donors to eliminate the possibility of disease contamination. In presenting the technic the authors describe various methods and equipment. Direct transfusion is recommended except in infants, in whom citrated blood has given better results. They seem to be favorably impressed with Judine's work on transfusion from the cadaver.

This excellent publication has brought the literature pertaining to this subject up to date, with an added appeal for transfusion centers. This program may prove ideal for continental Europe, but might not be so practical in the Western Hemisphere, because of the difference in distances between medical centers. The work is not only interestingly written, but provides all the present available knowledge regarding blood transfusion. While the entire study has been specifically confined to emergencies that present themselves in the field of otorhinolaryngology, the fundamental principles are applicable to the entire field of medicine.

Directory of Otolaryngologic Societies *

FOREIGN

Collegium Oto-Rhino-Laryngologicum Amicitiæ Sacrum

President: Prof. Gunnar Holmgren, Karolinska Mediko Kirurgiska Institut, Stockholm, Sweden.
Secretary: Prof. Dr. C. E. Benjamins, Verlengde Heereweg, 143 Groningen, The Netherlands.

NATIONAL

American Medical Association, Scientific Assembly, Section on Laryngology, Otology and Rhinology

Chairman: Dr. Ralph A. Fenton, 1020 S. W. Taylor St., Portland, Ore.
Secretary: Dr. Gordon B. New, Mayo Clinic, Rochester, Minn.
Place: Kansas City, Mo. Time: May 11-15, 1936.

American Academy of Ophthalmology and Otolaryngology

President: Dr. Wells P. Eagleton, 15 Lombardy St., Newark, N. J.
President-Elect: Dr. Frank E. Burch, 408 Peter St., St. Paul.
Executive Secretary: Dr. William P. Wherry, 1500 Medical Arts Bldg., Omaha.
Place: New York. Time: October 1936.

American Bronchoscopic Society

President: Dr. H. M. Taylor, 111 W. Adams St, Jacksonville, Florida.
Secretary: Dr. Lyman Richards, 319 Longwood Ave., Boston.

American Laryngological Association

President: Dr. Dunbar Roy, 113 N. Pryor St., Atlanta, Ga.
Secretary: Dr. W. V. Mullin, 9204 Euclid Ave., Cleveland.

American Laryngological, Rhinological and Otological Society, Inc.

President: Dr. Thomas E. Carmody, 227, 16th St., Denver.
Secretary: Dr. R. L. Loughran, Sharon, Conn.

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Eastern.—Chairman: Dr. Frederick T. Hill, Professional Bldg., Waterville, Maine.
Southern.—Chairman: Dr. Beverly R. Kennon, Medical Arts Bldg., Norfolk, Va.
Middle.—Chairman: Dr. Daniel W. Layman, Medical Arts Bldg., Indianapolis.
Mid-Western.—Chairman: Dr. Edward H. Cary, Medical Arts Bldg., Dallas, Texas.
Western.—Chairman: Dr. Frank A. Burton, Bank of America Bldg., San Diego, Calif.

American Otological Society

President: Dr. Francis R. Packard, 304 S. 19th St., Philadelphia.
Secretary: Dr. Thomas J. Harris, 104 E. 40th St., New York.

* Secretaries of societies are requested to furnish the information necessary to keep this list up to date.